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U.S. DEPARTMENT OF COMMERCE/National Bureau of Standards

Wavelengths and Transition Probabilities for Atoms and Atomic Ions

Part I. Wavelengths

Part II. Transition Probabilities

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Wavelengths and Transition Probabilities for Atoms and Atomic Ions

Part I. Wavelengths

Joseph Reader and Charles H. Corliss

Center for Radiation Research
National Measurement Laboratory
National Bureau of Standards
Washington, DC 20234

Part II. Transition Probabilities

W. L. Wiese and G. A. Martin

Center for Radiation Research
National Measurement Laboratory
National Bureau of Standards
Washington, DC 20234

U.S. DEPARTMENT OF COMMERCE, Philip M. Klutznick, Secretary
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Jordan J. Baruch, Assistant Secretary for Productivity, Technology and Innovation
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Foreword

The National Standard Reference Data System provides access to the quantitative data of physical science, critically evaluated and compiled for convenience and readily accessible through a variety of distribution channels. The System was established in 1963 by action of the President's Office of Science and Technology and the Federal Council for Science and Technology, and responsibility to administer it was assigned to the National Bureau of Standards.

NSRDS receives advice and planning assistance from a Review Committee of the National Research Council of the National Academy of Sciences-National Academy of Engineering. A number of Advisory Panels, each concerned with a single technical area, meet regularly to examine major portions of the program, assign relative priorities, and identify specific key problems in need of further attention. For selected specific topics, the Advisory Panels sponsor subpanels which make detailed studies of users' needs, the present state of knowledge, and existing data resources as a basis for recommending one or more data compilation activities. This assembly of advisory services contributes greatly to the guidance of NSRDS activities.

The System now includes a complex of data centers and other activities in academic institutions and other laboratories. Components of the NSRDS produce compilations of critically evaluated data, reviews of the state of quantitative knowledge in specialized areas, and computations of useful functions derived from standard reference data. The centers and projects also establish criteria for evaluation and compilation of data and recommend improvements in experimental techniques. They are normally associated with research in the relevant field.

The technical scope of NSRDS is indicated by the categories of projects active or being planned: nuclear properties, atomic and molecular properties, solid state properties, thermodynamic and transport properties, chemical kinetics, and colloid and surface properties.

Reliable data on the properties of matter and materials are a major foundation of scientific and technical progress. Such important activities as basic scientific research, industrial quality control, development of new materials for building and other technologies, measuring and correcting environmental pollution depend on quality reference data. In NSRDS, the Bureau's responsibility to support American science, industry, and commerce is vitally fulfilled.

E. Ambler.

ERNEST AMBLER, *Director*

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Wavelengths and Transition Probabilities for Atoms and Atomic Ions

Part I. Wavelengths

Joseph Reader and Charles H. Corliss

Center for Radiation Research, National Measurement Laboratory, National Bureau of Standards, Washington, D.C. 20234

Part II. Transition Probabilities

W. L. Wiese and G. A. Martin

Center for Radiation Research, National Measurement Laboratory, National Bureau of Standards, Washington, D.C. 20234

Wavelengths for about 47 000 spectral lines of atoms and atomic ions, as well as transition probabilities A for about 5000 lines, are tabulated. The data were selected in such a way as to include the prominent lines over a wide spectral region. Part I contains wavelengths of lines of neutral through quadruply ionized atoms in the range 40 to 40 000 Å. This information is presented in two different ways: 1) separate line lists grouped according to chemical element and further subdivided according to stage of ionization; and 2) a general table of wavelengths ordered numerically, with relative intensity, chemical element, and stage of ionization indicated for each line. Part II contains transition probability data for atoms in various stages of ionization, with emphasis on the neutral and singly ionized species. This table is arranged according to the chemical element and is further subdivided according to stage of ionization. Estimates of the accuracies of the A-values are provided. Wavelengths, energy levels, and statistical weights serve to identify the lines and to provide useful data for plasma spectroscopy applications.

Key words: Atom; atomic ion; intensities; line strengths; oscillator strengths; spectral lines; transition probabilities; wavelengths.

Part I. Wavelengths

Section 1. Arranged by Element

Section 2. Arranged by Wavelength

Joseph Reader and Charles H. Corliss

These tables were prepared under the auspices of the Committee on Line Spectra of the Elements of the National Academy of Sciences—National Research Council. They contain the outstanding spectral lines of neutral (I), singly ionized (II), doubly ionized (III), triply ionized (IV), and quadruply ionized (V), atoms. Listed are lines that appear in emission from the vacuum ultraviolet to the far infrared. For most atoms these lines were selected from much larger lists in such a way as to include the stronger observed lines in each spectral region. In a few cases prominent monoxide band heads are also given.

The data were compiled by the following contributors, whose initials are given in the headings of the tables that they prepared:

K. L. Andrew — Purdue University
J. G. Conway — Lawrence Berkeley Laboratory
C. H. Corliss — National Bureau of Standards
R. D. Cowan — Los Alamos Scientific Laboratory
C. R. Cowley — University of Michigan
Henry M. and Hannah Crosswhite — Argonne National Laboratory
S. P. Davis — University of California, Berkeley
V. Kaufman — National Bureau of Standards
R. L. Kelly — Naval Postgraduate School
J. F. Kielkopf — University of Louisville
W. C. Martin — National Bureau of Standards
T. K. McCubbin — Pennsylvania State University
L. J. Radziemski — Los Alamos Scientific Laboratory
J. Reader — National Bureau of Standards
G. V. Shalimoff — Lawrence Berkeley Laboratory
R. W. Stanley — Purdue University
J. O. Stoner, Jr. — University of Arizona
H. H. Stroke — New York University
D. R. Wood — Wright State University
E. F. Worden — Lawrence Livermore Laboratory
J. J. Wynne — I. B. M. Corporation
R. Zalubas — National Bureau of Standards

All wavelengths are given in Ångstroms. Below 2000 Å the wavelengths are in vacuum; above 2000 Å the wavelengths are in air. Wavelengths given to three decimal places have an uncertainty of less than 0.001 Å and are therefore suitable for the calibration of most spectrographs. In the air region, the elements used most commonly for calibration purposes are Ne, Ar, Kr, Fe, Th, and Hg; in the vacuum region, the most common are C, N, O, Si, and Cu.

A large number of the lines for the neutral and singly ionized atoms were extracted from the National Bureau of Standards (NBS) Tables of Spectral-Line Intensities [1][1]. The intensities of these lines represent quantitative estimates of relative line strengths that take account of varying detection sensitivity at different wavelengths. They are on a linear scale. For nearly all of the other lines the intensities represent qualitative estimates of the relative strengths of lines not greatly separated in wavelength. Because different observers frequently use different scales for their intensity estimates, these intensities are useful only as a rough indication of the appearance of a spectrum. In some cases the intensity scale is not intended to be linear. In the tables of first and second spectra the intensities of the lines of the singly ionized atom relative to those of the neutral atom should be used with caution, inasmuch as the concentration of ions in a light source depends greatly on the excitation conditions.

Hg I and II lines given to three decimal places are for Hg(198). Kr I and II lines below 11,000 Å given to three decimal places are for Kr(86). Xe I lines above 12,000 Å are for Xe(136).

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[1] Figures in brackets refer to literature references.

Descriptive symbols used in the tables have the following meanings:

c — complex
d — line consists of two unresolved lines
h — hazy
l — shaded to longer wavelengths
s — shaded to shorter wavelengths
p — perturbed by a close line
b — band head
r — easily reversed
w — wide

Part I is divided into two sections. In section 1 the lines are given in a separate table for each element. In section 2 the lines are given in a single table ordered by wavelength. The literature references are collected at the end of section 1.

Section 1. Arranged by Element

ACTINIUM (Ac)

Z = 89

Ac I and II
Ref. 193 - J.G.C.

Intensity	Wavelength Air	
8 h	2100.00	II
20	2712.50	II
10	2726.23	II
10 h	2760.18	II
10 h	2781.56	II
20	2797.59	II
20	2806.76	II
8	2833.47	II
150 h	2847.16	II
8	2895.20	II
30	2896.82	II
30	2923.02	II
200	2994.17	II
500	3043.30	II
200	3069.36	II
100	3078.07	II
100	3086.04	II
100	3087.37	II
200	3112.83	II
100	3120.16	II
500 s	3153.09	II
600 s	3154.41	II
200 s	3164.81	II
300 s	3230.59	II
150 s	3237.70	II
500	3260.91	II
100 s	3318.01	II
200 s	3383.53	II
200	3413.84	II
500	3417.77	II
500 s	3481.16	II
200	3489.53	II
100	3529.24	II
100	3534.63	II
200 s	3554.99	II
1000 s	3565.59	II
100	3694.88	II
300 s	3756.67	II
200	3799.82	II
2000 s	3863.12	II
100	3914.47	II
400 s	4061.60	II
3000 s	4088.44	II
3000 s	4168.40	II
100	4179.98	I
20	4183.12	I
20	4194.40	I
300 s	4209.69	II
300	4359.13	II
20 l	4384.53	I
1000 l	4386.41	II
20	4396.71	I
20	4462.73	I
1000 l	4507.20	II
500	4605.45	II
10	4716.58	I
400 s	4720.16	II
300	4812.22	II
100	4945.18	II
100	4958.23	II
100	4960.87	II
150	5446.38	II

Ac I and II

Intensity	Wavelength	
300 l	5732.05	II
400	5758.97	II
1000	5910.85	II
600 l	6164.75	II
200 l	6167.83	II
400	6242.83	II
20	6359.86	I
20 l	6691.27	I
6	7290.40	I
6 l	7866.10	I

Ac III
Ref. 193 - J.G.C.

	Air	
1000 h	2626.44	III
50 h	2682.90	III
2000 h	2952.55	III
2000 h	3392.78	III
3000	3487.59	III
2000 h	4413.09	III
3000 h	4569.87	III
8 h	5193.21	III

Ac IV
Ref. 193 - J.G.C.

	Air	
20 h	2062.00	IV
30 h	2502.12	IV
100 h	2558.08	IV
5 h	2790.83	IV
50 h	2793.90	IV
20 l	3224.7	IV

ALUMINUM (Al)

Z = 13

Al I and II
Refs. 81,89,144,227,228,282 - E.F.W.
Vacuum

40	1177.43	II
50	1191.812	II
150	1350.18	II
800	1539.830	II
100	1569.385	II
125	1596.059	II
150	1625.627	II
100	1644.235	II
100	1644.809	II
1000	1670.787	II
100	1686.250	II
800	1719.440	II
500	1721.244	II
900	1721.271	II
500	1724.952	II
900	1724.984	II
350	1760.104	II
300	1761.975	II
290	1763.00	I
500	1763.869	II
700	1763.952	II
450	1765.64	I
300	1765.815	II
450	1766.38	I
400	1767.731	II
450	1769.14	I
600	1828.588	II
400	1832.837	II
250	1834.808	II

Al I and II

Intensity	Wavelength	
300	1855.929	II
700	1858.026	II
120	1859.980	II
1000	1862.311	II
200	1929.978	II
150	1931.048	II
200	1932.377	II
400	1934.503	II
150	1934.713	II
150	1936.907	II
220	1939.261	II
700	1990.531	II
	Air	
150	2016.052	II
150	2016.234	II
100	2016.368	II
200	2074.008	II
700	2094.264	II
150	2094.744	II
300	2094.791	II
100	2095.104	II
200	2095.141	II
60	2150.70	I
60	2181.00	I
400	2269.10	I
120	2269.22	I
60	2312.49	I
70	2313.53	I
90	2317.48	I
60	2319.06	I
140	2321.56	I
460	2367.05	I
110	2367.61	I
110	2368.11	I
180	2369.30	I
140	2370.22	I
70	2370.73	I
160	2372.07	I
850	2373.12	I
170	2373.35	I
110	2373.57	I
60	2378.40	I
60	2513.30	I
240	2567.98	I
480	2575.10	I
60	2575.40	I
80	2631.55	II
110	2637.70	II
150	2652.48	I
200	2660.39	I
160	2669.17	II
650	2816.19	II
90	2837.96	I
90	2840.10	I
150	3041.28	II
360	3050.07	I
60	3054.68	I
450	3057.14	I
90	3064.29	I
60	3066.14	I
150	3074.64	II
4500 r	3082.153	I
7200 r	3092.710	I
1800 r	3092.839	I
150	3428.92	II
70	3439.35	I
150	3443.64	I
70	3444.86	I
70	3458.22	I

Al I and II

Intensity	Wavelength	
60	3479.81	I
60	3482.63	I
450	3586.56	II
360	3587.07	II
290	3587.45	II
220	3651.06	II
110	3651.10	II
150	3654.98	II
290	3655.00	II
450	3900.68	II
60	3932.00	I
4500 r	3944.006	I
9000 r	3961.520	I
110	3995.86	II
290	4226.81	II
150	4585.82	II
110	4588.19	II
550	4666.80	II
110	4898.76	II
110	4902.77	II
150	5280.21	II
70	5107.52	I
290	5283.77	II
150	5285.85	II
110	5312.32	II
220	5316.07	II
150	5371.84	II
180	5557.06	I
110	5557.95	I
450	5593.23	II
110	5853.62	II
220	5971.94	II
290	6001.76	II
220	6001.88	II
450	6006.42	II
150	6061.11	II
290	6068.43	II
110	6068.53	II
450	6073.23	II
110	6181.57	II
150	6181.68	II
290	6182.28	II
220	6182.45	II
450 h	6183.42	II
450	6201.52	II
360	6201.70	II
290	6226.18	II
360	6231.78	II
450	6243.36	II
450	6335.74	II
360	6696.02	I
230	6698.67	I
60	7083.97	I
70	7084.64	I
110	7361.57	I
140	7362.30	I
60	7606.16	I
90	7614.82	I
230	7835.31	I
290	7836.13	I
60	7993.05	I
90	8003.19	I
70	8065.97	I
110	8075.35	I
290	8640.70	II
360	8772.87	I
450	8773.90	I
110	8828.91	I
180	8841.28	I

Al I and II

Intensity	Wavelength	
90	8912.90	I
140	8923.56	I
60	9089.91	I
70	9139.95	I
150	9290.65	II
110	9290.75	II
150	10076.29	II
110	10768.36	I
140	10782.04	I
110	10872.98	I
230	10891.73	I
450	11253.19	I
570	11254.88	I
570	13123.41	I
450	13150.76	I
230	16718.96	I
300	16750.56	I
140	16763.36	I
300	21093.04	I
360	21163.75	I

Al III

Refs. 127 - E.F.W.

Vacuum		
70	486.884	III
30	486.912	III
250	511.138	III
150	511.191	III
500	560.317	III
200	560.433	III
100	670.068	III
200	671.118	III
500	695.829	III
400	696.217	III
200	725.683	III
300	726.915	III
400	855.034	III
500	856.746	III
400	892.024	III
50	893.887	III
450	893.897	III
10	1162.59	III
5	1162.62	III
100	1352.81	III
5	1352.82	III
70	1352.86	III
600	1379.67	III
800	1384.13	III
700	1605.766	III
100	1611.814	III
800	1611.874	III
1000	1854.716	III
600	1862.790	III
300	1935.840	III
15	1935.863	III
200	1935.949	III
Air		
110	2399.00	III
285	2762.77	III
220	2762.87	III
450	2906.93	III
360	3348.52	III
290	3350.88	III
870	3601.63	III
550	3601.93	III
750	3612.36	III
450	3702.11	III
550	3713.12	III
110 h	3980.14	III

Al III

Intensity	Wavelength	
110	4082.45	III
150	4088.61	III
110 h	4142.37	III
650	4149.92	III
650	4150.17	III
110 h	4364.64	III
650	4479.89	III
650	4479.97	III
760	4512.56	III
550	4528.94	III
870	4529.19	III
110	4701.15	III
150	4701.41	III
110 h	4904.10	III
110 h	5151.01	III
110 h	5163.89	III
1200	5696.60	III
1000	5722.73	III
110	6055.21	III
220 h	7635.37	III
150	7660.26	III
220	7681.97	III
360	7881.79	III
150	7882.52	III
290	7905.51	III
290 h	8243.59	III
360 h	8275.11	III
290	9571.52	III
360	9605.99	III

Al IV

Refs. 8,146 - E.F.W.

Vacuum		
400	124.03	IV
700	129.73	IV
800	160.07	IV
700	161.69	IV
500	1027.34	IV
800	1042.17	IV
700	1048.52	IV
500	1058.90	IV
500	1061.43	IV
600	1064.89	IV
500	1066.57	IV
600	1069.44	IV
400	1105.74	IV
600	1118.82	IV
500	1125.61	IV
400	1136.82	IV
400	1198.50	IV
400	1220.55	IV
900	1237.19	IV
600	1240.21	IV
700	1240.86	IV
700	1248.79	IV
900	1257.62	IV
800	1264.18	IV
1000	1272.76	IV
400	1337.90	IV
500	1376.62	IV
500	1388.79	IV
600	1431.94	IV
700	1441.82	IV
800	1447.51	IV
600	1457.96	IV
700	1486.89	IV
800	1494.79	IV
400	1519.07	IV
800	1537.54	IV

Al IV

Intensity	Wavelength	
500	1550.19	IV
1000	1557.25	IV
500	1559.03	IV
700	1564.16	IV
900	1582.04	IV
800	1584.46	IV
400	1589.28	IV
400	1606.65	IV
400	1617.81	IV
600	1627.54	IV
500	1636.82	IV
800	1639.06	IV
1000	1818.56	IV
700	1881.16	IV
Air		
400	2515.87	IV
500	3208.20	IV
500	3267.21	IV
600	3285.13	IV
400	3344.46	IV
500	3473.54	IV
900	3492.23	IV
800	3508.46	IV
500	3511.28	IV
700	3517.56	IV
400	3527.03	IV
500	3541.08	IV

Al V

Ref. 6 - E.F.W

Vacuum		
300	103.80	V
400	103.88	V
250	104.07	V
250	104.18	V
600	107.95	V
300	108.06	V
300	108.11	V
250	118.50	V
900	125.53	V
800	126.07	V
800	130.41	V
1000	130.85	V
900	131.00	V
900	131.44	V
500	132.63	V
1000	278.69	V
900	281.39	V
250	1068.26	V
500	1088.67	V
300	1090.14	V
300	1150.30	V
350	1165.42	V
250	1168.48	V
500	1287.70	V
400	1330.06	V
400	1350.52	V
400	1363.35	V
600	1369.20	V
300	1373.70	V
400	1445.87	V
300	1455.26	V
600	1475.64	V
300	1486.05	V
700	1508.37	V
1000	1526.14	V
500	1539.12	V
300	1577.90	V
350	1589.87	V

AMERICIUM (Am)

Z = 95

Am I and II

Ref. 92 - J.G.C.

Intensity	Wavelength	
Air		
100 s	2706.35	II
100 s	2728.69	II
200 s	2756.55	II
100 l	2812.10	II
200 s	2812.92	II
1000 l	2815.28	II
100 s	2815.98	II
100 l	2831.24	II
5000 s	2832.26	II
100 l	2833.95	II
100 l	2861.92	II
100 s	2866.20	II
1000 l	2888.51	II
100 l	2893.29	II
200 l	2899.56	II
100 l	2909.86	II
200 l	2911.13	II
1000 s	2920.59	II
200 l	2927.53	II
200 l	2936.99	II
100 l	2939.08	II
500 l	2950.39	II
100 s	2957.05	II
100 l	2958.39	II
100 l	2963.02	II
1000 l	2966.71	II
1000 l	2969.29	II
1000 s	2987.24	II
500 l	2993.51	II
1000 s	3004.25	II
500 s	3027.99	II
100 l	3028.86	II
500 l	3038.36	II
200 s	3053.69	II
2000 s	3120.49	II
200 s	3161.83	II
100 s	3167.86	II
100 l	3203.26	II
500 s	3282.32	II
200 l	3286.67	II
100 l	3343.87	I
500 s	3362.55	II
200 l	3395.01	I
200 s	3419.66	II
200	3446.19	I
1000 l	3452.10	II
5000 l	3483.31	II
5000	3510.13	I
1000 l	3530.95	I
200 s	3562.68	II
5000	3569.16	I
100 s	3596.07	II
500	3603.41	I
5000	3673.12	I
100 l	3684.57	II
1000 s	3696.42	II
100 l	3707.86	II
5000 l	3777.50	II
5000 l	3926.25	II
1000 l	3952.58	II
100 s	4020.25	I

Am I and II

Intensity	Wavelength	
100 s	4035.81	I
500 s	4036.37	II
5000 s	4089.29	II
100 l	4089.32	II
100 s	4140.96	I
1000 s	4188.12	II
1000	4265.55	I
5000	4289.26	I
200 s	4309.65	II
2000 s	4324.57	II
2000 s	4441.36	II
5000 l	4509.45	II
5000 l	4575.59	II
1000 s	4593.31	II
100 l	4649.12	I
100 l	4653.45	I
5000 l	4662.79	I
2000 l	4681.65	I
2000 l	4699.70	II
1000 l	4706.80	I
2000 l	4872.22	II
200 l	4990.79	I
100 s	5000.21	I
1000 l	5020.96	II
200 l	5215.99	II
1000 s	5402.62	I
1000 s	5424.70	I
1000 l	5584.21	II
1000 s	5598.13	I
10000 l	6054.64	I
1000 l	6405.11	I
500 l	6544.16	I
500 s	6955.58	I

ANTIMONY (Sb)

Z = 51

Sb I and II

Ref. 167,194 – L.J.R.

Vacuum

1	691.20	II
1	764.43	II
1	814.85	II
1	849.39	II
2	855.08	II
4	876.84	II
4	921.07	II
6	983.57	II
6	1001.13	II
6	1009.43	II
6	1052.21	II
8	1056.27	II
8	1057.32	II
6	1073.81	II
6	1230.30	II
8	1274.98	II
8	1327.40	II
6	1358.04	II
8	1384.70	II
6	1407.83	II
10	1430.76	I
8	1436.49	II
10 h	1464.19	I
20 r	1486.57	I
40 h	1491.36	I
50 r	1512.57	I
120 r	1532.74	I
80 r	1535.06	I

Sb I and II

Intensity	Wavelength	
6	1565.51	II
8	1576.11	II
7	1581.36	II
80 r	1599.96	I
10	1606.98	II
200 w	1612.8	I
100 w	1623.3	I
50 h	1651.20	I
20	1657.04	II
100 w	1662.6	I
50	1698.85	I
80 r	1716.93	I
150 r	1717.45	I
150 r	1723.43	I
100 r	1736.19	I
8	1736.43	II
50	1757.79	I
100 h	1765.76	I
100 r	1780.87	I
100 r	1788.24	I
150	1800.18	I
50 r	1810.50	I
80 r	1814.20	I
100	1829.50	I
60	1858.89	I
50 r	1868.17	I
300 r	1871.15	I
150 r	1882.56	I
70	1891.28	I
70	1899.39	I
100	1927.08	I
200 r	1950.39	I
80 h	1964.3	I
60	1986.05	I
6	1990.60	II
	Air	
50	2024.00	I
60 r	2029.49	I
70 r	2039.77	I
150 r	2049.57	I
50	2063.43	I
1000 r	2068.33	I
100	2079.56	I
50 r	2098.41	I
80 r	2118.48	I
100 r	2127.39	I
50 r	2137.05	I
100 r	2139.69	I
10	2141.80	II
50 r	2141.83	I
100 r	2144.86	I
50	2158.91	I
1500 r	2175.81	I
250 r	2179.19	I
6	2179.25	II
200 r	2201.32	I
300 r	2208.45	I
6	2208.50	II
150 r	2220.73	I
100	2221.98	I
120 r	2224.93	I
6	2225.15	II
300 r	2262.51	I
120	2288.98	I
150 r	2293.44	I
300 r	2306.46	I
2500 r	2311.47	I
150	2315.89	I
400 h	2373.67	I

Sb I and II

Intensity	Wavelength	
300 h	2383.64	I
100	2395.22	I
150	2422.13	I
250	2426.35	I
400 r	2445.51	I
400	2478.32	I
150	2480.44	I
8	2480.46	II
100	2510.54	I
2000 r	2528.52	I
15	2528.54	II
10	2567.75	II
150	2574.06	I
1500 r	2598.05	I
500 r	2598.09	I
300 r	2612.31	I
200 r	2652.60	I
12	2656.55	II
300 r	2670.64	I
200 r	2682.76	I
120	2692.25	I
150 r	2718.90	I
400 r	2769.95	I
12	2851.09	II
100	2851.11	I
1000 r	2877.92	I
12	2966.10	II
15	2980.96	II
500 r	3029.83	I
12	3034.01	II
12	3040.67	II
600 r	3232.52	I
20	3241.28	II
700 r	3267.51	I
12	3383.09	II
100	3383.15	I
15	3498.46	II
12	3520.47	II
25	3637.80	II
250	3637.83	I
20	3722.78	II
200 r	3722.79	I
20	3850.22	II
200	4033.55	I
20	4033.56	II
20	4133.63	II
15	4140.54	II
15	4195.17	II
20	4219.07	II
20	4314.32	II
12	4344.83	II
12	4411.42	II
12	4446.48	II
12	4506.92	II
15	4514.50	II
30	4596.90	II
20	4599.09	II
15	4604.77	II
30	4647.32	II
20	4675.74	II
40	4711.26	II
12	4735.44	II
20	4757.81	II
20	4765.36	II
12	4766.91	II
30	4784.03	II
20	4802.01	II
20	4832.82	II
20	4877.24	II

Sb I and II

Intensity	Wavelength	
15	4947.40	II
15	5044.56	II
12	5166.32	II
15	5176.55	II
20	5238.94	II
20	5354.24	II
15	5464.08	II
30 h	5490.32	I
40 h	5556.10	I
15	5568.13	II
30 l	5602.19	I
100 l	5632.02	I
30	5639.75	II
60 h	5830.34	I
15	5895.09	II
100	6005.21	II
20	6053.41	II
30	6079.80	II
50	6130.04	II
20	6154.94	II
12	6302.76	II
20	6611.49	I
30	6647.44	II
15	6688.01	II
6	6806.67	II
30 h	7648.28	I
80	7844.44	I
200	7924.65	I
40 h	7969.55	I
60	8411.69	I
150	8572.64	I
100	8619.55	I
30 h	8682.7	I
30	9132.21	I
400	9518.68	I
30	9866.78	I
400	9949.14	I
200	10078.49	I
300	10261.01	I
50	10364.33	I
50 h	10488.3	I
200	10585.60	I
1000	10677.41	I
800	10741.94	I
80	10794.11	I
600	10839.73	I
200	10868.58	I
400	10879.55	I
300	11012.79	I
40 h	11079.95	I
30 h	11084.98	I
50 h	11104.84	I
50 h	11108.52	I
30	11189.61	I
150	11266.23	I
30	11863.37	I
1	11957.7	I
5	12116.06	I
2	12276.6	I
2	12466.75	I

Sb III

Ref 164 – L.J.R. and J.R.

Vacuum

10	691.18	III
10	698.69	III
15	722.86	III
8	724.81	III
15	732.33	III

Sb III		
Intensity	Wavelength	
15	999.62	III
40	1011.94	III
10	1056.58	III
40	1065.90	III
20	1069.93	III
20	1070.43	III
5	1073.76	III
30	1075.82	III
5	1078.10	III
20	1084.06	III
10	1098.34	III
10	1135.43	III
30	1151.49	III
40	1157.74	III
12	1166.96	III
50	1205.20	III
50	1210.64	III
20	1306.69	III
8	1379.58	III
20	1404.18	III
10	1429.57	III
15	1673.89	III
3	1710.23	III
15	1711.84	III
15	1725.33	III
12	1762.30	III
12	1839.32	III
10	1946.13	III
Air		
3	2054.10	III
2	2091.85	III
5	2127.00	III
5	2507.71	III
15	2590.13	III
1	2614.20	III
12	2617.17	III
1	2617.63	III
20	2669.39	III
5	2785.87	III
20	2790.27	III
20	3336.61	III
50	3504.07	III
15	3519.06	III
15	3533.45	III
40	3559.18	III
40	3566.25	III
30	3738.90	III
40	4265.09	III
50	4352.16	III
30	4591.89	III
30	4692.91	III
1	5247.71	III
1	5690.8	III
1	5717.3	III
3	5845.5	III
5	6246.7	III
3	6287.6	III

Sb IV		
Ref. 386 - L.J.R.		
Vacuum		
	861.5	IV
	873.5	IV
	888.3	IV
	891.2	IV
	1087.6	IV
	1099.3	IV
	1115.1	IV
	1120.4	IV

Sb IV		
Intensity	Wavelength	
	1145.9	IV
	1151.5	IV
	1171.4	IV
	1192.9	IV
	1199.1	IV
	1499.2	IV

Sb V		
Ref. 406 - L.J.R.		
Vacuum		
3	699.22	V
1	746.06	V
6	831.00	V
1	898.02	V
8	1104.32	V
12	1226.00	V
12	1505.70	V
12	1524.47	V

ARGON (Ar)

Z = 18

Ar I and II		
Refs. 190,203,204,219 - E.F.W		
Vacuum		
30	487.227	II
50	490.650	II
30	490.701	II
30	519.327	II
30	542.912	II
200	543.203	II
70	547.461	II
70	556.817	II
70	573.362	II
30	576.736	II
70	580.263	II
30	583.437	II
70	597.700	II
30	602.858	II
30	612.372	II
500	661.867	II
30	664.562	II
200	666.011	II
1000	670.946	II
3000	671.851	II
70	676.242	II
30	677.952	II
30	679.218	II
200	679.401	II
200	718.090	II
3000	723.361	II
500	725.548	II
70	730.930	II
200	740.269	II
200	744.925	II
70	745.322	II
20	802.859	I
100	806.471	I
60	806.869	I
30	807.218	I
40	807.653	I
50	809.927	I
120	816.232	I
70	816.464	I
80	820.124	I
120	825.346	I
120	826.365	I
150	834.392	I

Ar I and II		
Intensity	Wavelength	
100	835.002	I
100	842.805	I
180	866.800	I
150	869.754	I
180 r	876.058	I
180 r	879.947	I
150	894.310	I
1000	919.781	II
1000	932.054	II
1000 r	1048.220	I
500 r	1066.660	I
Air		
5	2420.456	II
10	2516.789	II
10	2534.709	II
15	2562.087	II
25	2891.612	II
200	2942.893	II
100	2979.050	II
50	3033.508	II
50	3093.402	II
8	3200.37	I
20	3243.689	II
25	3293.640	II
20	3307.228	II
7	3319.34	I
25	3350.924	II
7	3373.47	I
25	3376.436	II
25	3388.531	II
7	3393.73	I
7	3461.07	I
70	3476.747	II
20	3478.232	II
50	3491.244	II
100	3491.536	II
70	3509.778	II
70	3514.388	II
70	3545.596	II
70	3545.845	II
7	3554.306	I
100	3559.508	II
100	3561.030	II
70	3576.616	II
25	3581.608	II
50	3582.355	II
70	3588.441	II
7	3606.522	I
25	3622.138	II
20	3639.833	II
35	3718.206	II
70	3729.309	II
50	3737.889	II
150	3765.270	II
50	3766.119	II
20	3770.369	I
20	3770.520	II
25	3780.840	II
25	3803.172	II
50	3809.456	II
7	3834.679	I
70	3850.581	II
35	3868.528	II
35	3925.719	II
50	3928.623	II
25	3932.547	II
70	3946.097	II
7	3947.505	I
35	3948.979	I

Ar I and II		
Intensity	Wavelength	
20	3979.356	II
35	3994.792	II
50	4013.857	II
50	4033.809	II
20	4035.460	II
150	4042.894	II
50	4044.418	I
100	4052.921	II
200	4072.005	II
70	4072.385	II
25	4076.628	II
35	4079.574	II
25	4082.387	II
150	4103.912	II
300	4131.724	II
35	4156.086	II
400	4158.590	I
50	4164.180	I
35	4179.297	II
50	4181.884	I
100	4190.713	I
50	4191.029	I
200	4198.317	I
400	4200.674	I
25	4218.665	II
25	4222.637	II
25	4226.988	II
100	4228.158	II
100	4237.220	II
25	4251.185	I
200	4259.362	I
100	4266.286	I
70	4266.527	II
150	4272.169	I
550	4277.528	II
20	4282.898	II
100	4300.101	I
25	4300.650	II
70	4309.239	II
200	4331.200	II
50	4332.030	II
100	4333.561	I
50	4335.338	I
25	4345.168	I
800	4348.064	II
50	4352.205	II
25	4362.066	II
50	4367.832	II
200	4370.753	II
70	4371.329	II
50	4375.954	II
150	4379.667	II
50	4385.057	II
70	4400.097	II
200	4400.986	II
400	4426.001	II
150	4430.189	II
50	4430.996	II
50	4433.838	II
20	4439.461	II
35	4448.879	II
100	4474.759	II
200	4481.811	II
100	4510.733	I
20	4522.323	I
20	4530.552	II
400	4545.052	II
20	4564.405	II
400	4579.350	II

Ar I and II			Ar I and II			Ar I and II			Ar III		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
										Vacuum	
400	4589.898	II	70	6416.307	I	550	9194.638	I	12	769.15	III
15	4596.097	I	25	6483.082	II	15000	9224.499	I	10	871.10	III
550	4609.567	II	15	6538.112	I	400	9291.531	I	9	875.53	III
7	4628.441	I	15	6604.853	I	1600	9354.220	I	12	878.73	III
35	4637.233	II	25	6638.221	II	25000	9657.786	I	8	879.62	III
400	4657.901	II	20	6639.740	II	4500	9784.503	I	9	883.18	III
15	4702.316	I	50	6643.698	II	180	10052.06	I	10	887.40	III
20	4721.591	II	5	6660.676	I	30	10332.72	I	7	1669.67	III
550	4726.868	II	5	6664.051	I	100	10467.177	II	7	1673.42	III
50	4732.053	II	25	6666.359	II	1600	10470.054	I	7	1675.48	III
300	4735.906	II	100	6677.282	I	13	10478.034	I	9	1914.40	III
800	4764.865	II	35	6684.293	II	180	10506.50	I	7	1915.56	III
550	4806.020	II	150	6752.834	I	200	10673.565	I		Air	
150	4847.810	II	5	6756.163	I	11	10681.773	I	10	2125.16	III
50	4865.910	II	15	6766.612	I	7	10683.034	II	15	2133.87	III
800	4879.864	II	20	6861.269	II	30	10733.87	I	10	2138.59	III
70	4889.042	II	150	6871.289	I	30	10759.16	I	10	2148.73	III
20	4904.752	II	5	6879.582	I	7	10812.896	II	15	2166.19	III
35	4933.209	II	10	6888.174	I	11	11078.869	I	10	2168.26	III
200	4965.080	II	50	6937.664	I	30	11106.46	I	20	2170.23	III
50	5009.334	II	7	6951.478	I	12	11441.832	I	25	2177.22	III
70	5017.163	II	7	6960.250	I	400	11488.109	I	8	2184.06	III
70	5062.037	II	10000	6965.431	I	200	11668.710	I	10	2188.22	III
20	5090.495	II	150	7030.251	I	12	11719.488	I	15	2192.06	III
100	5141.783	II	10000	7067.218	I	200	12112.326	I	7	2248.73	III
70	5145.308	II	100	7068.736	I	50	12139.738	I	10	2279.10	III
5	5151.391	I	25	7107.478	I	50	12343.393	I	7	2281.22	III
15	5162.285	I	25	7125.820	I	200	12402.827	I	7	2282.21	III
25	5165.773	II	1000	7147.042	I	200	12439.321	I	12	2293.03	III
20	5187.746	I	15	7158.839	I	100	12456.12	I	10	2300.85	III
20	5216.814	II	70	7206.980	I	200	12487.663	I	15	2302.17	III
7	5221.271	I	15	7265.172	I	150	12702.281	I	9	2317.00	III
5	5421.352	I	7	7270.664	I	30	12733.418	I	15	2317.47	III
10	5451.652	I	2000	7272.936	I	12	12746.232	I	12	2318.04	III
25	5495.874	I	35	7311.716	I	200	12802.739	I	10	2319.13	III
5	5506.113	I	25	7316.005	I	50	12933.195	I	10	2319.37	III
25	5558.702	I	5	7350.814	I	500	12956.659	I	9	2345.17	III
10	5572.541	I	70	7353.293	I	200	13008.264	I	7	2351.67	III
35	5606.733	I	200	7372.118	I	200	13213.99	I	9	2360.26	III
20	5650.704	I	20	7380.426	II	200	13228.107	I	10	2395.63	III
10	5739.520	I	10000	7383.980	I	100	13230.90	I	12	2399.15	III
5	5834.263	I	20	7392.980	I	500	13272.64	I	10	2413.20	III
10	5860.310	I	15	7412.337	I	1000	13313.210	I	7	2415.61	III
15	5882.624	I	10	7425.294	I	1000	13367.111	I	10	2418.82	III
25	5888.584	I	25	7435.368	I	30	13499.41	I	12	2423.52	III
50	5912.085	I	10	7436.297	I	1000	13504.191	I	12	2423.93	III
15	5928.813	I	20000	7503.869	I	11	13573.617	I	7	2443.69	III
5	5942.669	I	15000	7514.652	I	30	13599.333	I	8	2472.95	III
7	5987.302	I	25000	7635.106	I	400	13622.659	I	7	2476.10	III
5	5998.999	I	15000	7723.761	I	200	13678.550	I	12	2488.86	III
5	6025.150	I	10000	7724.207	I	1000	13718.577	I	7	2631.90	III
70	6032.127	I	10	7891.075	I	10	13825.715	I	10	2654.63	III
35	6043.223	I	20000	7948.176	I	10	13907.478	I	8	2674.02	III
10	6052.723	I	20000	8006.157	I	200	14093.640	I	9	2678.38	III
20	6059.372	I	25000	8014.786	I	100	15046.50	I	10	2724.84	III
7	6098.803	I	7	8053.308	I	25	15172.69	I	7	2762.23	III
10	6105.635	I	20000	8103.693	I	10	15329.34	I	7	2842.88	III
100	6114.923	II	35000	8115.311	I	30	15989.49	I	8	2855.29	III
10	6145.441	I	10000	8264.522	I	30	16519.86	I	9	2884.12	III
7	6170.174	I	20	8392.27	I	500	16940.58	I	10	3010.02	III
150	6172.278	II	15000	8408.210	I	12	18427.76	I	12	3024.05	III
10	6173.096	I	20000	8424.648	I	50	20616.23	I	12	3054.82	III
10	6212.503	I	15000	8521.442	I	30	20986.11	I	10	3064.77	III
5	6215.938	I	7	8605.776	I	20	23133.20	I	10	3078.15	III
25	6243.120	II	4500	8667.944	I	20	23966.52	I	7	3110.41	III
7	6296.872	I	20	8771.860	II				7	3127.90	III
15	6307.657	I	180	8849.91	I		Ar III		25	3285.85	III
7	6369.575	I	20	9075.394	I		Refs. 367,372,373,375		20	3301.88	III
20	6384.717	I	35000	9122.967	I		- E.F.W.				

Ar III

Intensity	Wavelength	
15	3311.25	III
7	3323.59	III
25	3336.13	III
20	3344.72	III
15	3358.49	III
7	3361.28	III
15	3391.85	III
7	3417.49	III
9	3424.25	III
8	3438.04	III
9	3471.32	III
20	3480.55	III
12	3499.67	III
15	3503.58	III
8	3511.12	III
20	3795.37	III
10	3858.32	III
7	3907.84	III
8	3960.53	III
6	4023.60	III
5	4146.70	III

Ar IV

Ref. 367,368,374 - E.F.W.

Vacuum

4	396.87	IV
4	398.55	IV
6	623.77	IV
10	683.28	IV
7	688.39	IV
12 p	689.01	IV
6	699.41	IV
8	700.28	IV
4	754.20	IV
5	761.47	IV
5	800.57	IV
10	801.09	IV
10	801.41	IV
5	801.91	IV
15	840.03	IV
20	843.77	IV
25	850.60	IV
5	900.36	IV
9	901.17	IV

Air

4	2299.72	IV
8	2447.71	IV
12	2513.28	IV
6	2518.40	IV
9	2525.69	IV
12	2562.17	IV
10	2568.07	IV
7	2569.53	IV
12	2599.47	IV
10	2608.06	IV
7	2608.44	IV
12	2615.68	IV
6	2619.98	IV
12	2621.36	IV
12	2624.92	IV
15	2640.34	IV
9	2682.63	IV
14	2757.92	IV
10	2776.26	IV
12	2784.47	IV
14	2788.96	IV
7	2797.11	IV
16	2809.44	IV
10	2830.25	IV

Ar IV

Intensity	Wavelength	
6	2874.40	IV
12	2913.00	IV
11	2926.33	IV
6	3037.98	IV
8	3077.40	IV

Ar V

Refs. 414,421 - E.F.W.

Vacuum

3	336.56	V
3	337.56	V
6	338.00	V
2	338.43	V
2	339.01	V
3	339.89	V
3	350.88	V
2	436.67	V
5	446.00	V
8	446.95	V
4	447.53	V
18	449.06	V
4	449.49	V
3	458.12	V
2	458.98	V
6 p	461.23	V
3	462.42	V
7	463.94	V
3	522.09	V
5	524.19	V
6	527.69	V
2	554.50	V
5	558.48	V
3	635.12	V
3	705.35	V
5	709.20	V
4	715.60	V
3	715.65	V
2	725.11	V
4	822.16	V
5	827.05	V
3	827.35	V
4 p	834.88	V
2	836.13	V

ARSENIC (As)

Z = 33

As I and II

Refs. 168,197 - R.L.K.

Vacuum

165	761.24	II
165	802.83	II
340	1021.96	II
340	1082.35	II
500	1139.40	II
615	1149.31	II
555	1181.51	II
555	1189.87	II
615	1196.38	II
615	1196.56	II
340	1207.44	II
800	1211.17	II
800	1218.10	II
340	1223.15	II
760	1241.31	II
965	1243.08	II
870	1245.67	II
800	1258.58	II
965	1263.77	II

As I and II

Intensity	Wavelength	
800	1266.34	II
800	1267.59	II
715	1280.99	II
715	1287.54	II
715	1305.70	II
340	1307.74	II
760	1333.15	II
965	1341.55	II
760	1355.93	II
965	1369.77	II
800	1373.65	II
1000	1375.07	II
760	1375.78	II
800	1394.64	II
800	1400.31	II
500	1448.59	II
500	1558.88	II
500	1570.99	II
100 r	1593.60	I
500	1660.55	II
100	1758.60	I
170	1806.15	I
340	1860.34	II
1000 r	1890.42	I
500	1912.94	II
800 r	1937.59	I
585 r	1972.62	I
170 r	1990.35	I
100 r	1991.13	I
100 r	1995.43	I

Air

230 r	2003.34	I
100 r	2009.19	I
100	2013.32	I
100	2112.99	I
100	2144.08	I
135	2165.52	I
350 r	2288.12	I
350 r	2349.84	I
100 r	2370.77	I
135 r	2381.18	I
170 r	2456.53	I
340	2602.00	II
170 r	2780.22	I
300	2830.359	II
300	2831.164	II
100 r	2860.44	I
300	2884.406	II
615	2959.572	II
300	3003.819	II
300	3116.516	II
340	3842.60	II
715	4190.082	II
615	4197.40	II
615	4242.982	II
500	4315.657	II
500	4323.867	II
500	4336.64	II
500	4352.145	II
425	4352.864	II
375	4371.17	II
615	4427.106	II
615	4431.562	II
715	4458.469	II
340	4461.075	II
715	4466.348	II
500	4474.46	II
800	4494.230	II
850	4507.659	II

As I and II

Intensity	Wavelength	
615	4539.74	II
715	4543.483	II
615	4602.427	II
340	4629.787	II
340	4707.586	II
340	4730.67	II
340	4888.557	II
100	5068.98	I
340	5105.58	II
500	5107.55	II
100	5121.34	I
100	5141.63	I
425	5231.38	II
500	5331.23	II
100	5408.13	I
135	5451.32	I
340	5497.727	II
425	5558.09	II
425	5651.32	II
425	6110.07	II
500	6170.27	II
300	6511.74	II
300	7092.27	II
300	7102.72	II
340	7990.53	II
300	8174.51	II
100	8428.91	I
100	8564.71	I
100	8654.14	I
135	8821.73	I
100	8869.66	I
135	9267.28	I
200	9300.61	I
230	9597.95	I
290	9626.70	I
230	9833.76	I
100	9886.05	I
140	9900.55	I
170	9915.71	I
290	9923.05	I
100	10010.63	I
290	10024.04	I
100	10453.09	I
100	10575.02	I
170	10614.07	I

As III

Ref. 163 - R.L.K.

Vacuum

185	849.9	III
185	866.3	III
510	871.7	III
325	889.0	III
325	927.5	III
325	953.6	III
325	937.2	III
325	963.8	III
120	1172.2	III
185	1209.3	III

Air

80	2926.3	III
185	2982.0	III
325	3922.6	III
185	4037.2	III

As IV

Ref. 244 – R.L.K.

Air

150	2253.1	IV
200	2263.2	IV

As IV

Intensity	Wavelength	
200	2301.0	IV
250	2417.5	IV
150	2446.1	IV
250	2454.0	IV
200	2461.4	IV
150	3108.8	IV

As V

Ref. 280 - R.L.K.

Vacuum

25	600.7	V
40	616.0	V
120	715.5	V
150	734.8	V
60	737.2	V
250	987.7	V
250	1029.5	V
40	1051.6	V
60	1056.6	V

ASTATINE (At)

Z = 85

At I and II

Ref. 188 - E.F.W.

Air

8	2162.25	I
10	2244.01	I

BARIUM (Ba)

Z = 56

Ba I and II

Refs. 1,252,277,279 - J.J.W.

Vacuum

200	1486.72	II
400	1504.01	II
300	1554.38	II
200	1572.73	II
	1573.92	II
	1630.40	II
100	1674.51	II
400	1694.37	II
	1697.16	II
	1761.75	II
	1771.03	II
	1786.93	II
100	1904.15	II
500	1924.70	II
	1985.60	II
300	1999.54	II

Air

	2009.20	II
400	2023.95	II
	2052.68	II
	2054.57	II
500	2214.7	II
800	2245.61	II
1000	2254.73	II
1400	2304.24	II
2000	2335.27	II
190	2347.58	II
60	2528.51	II
8 h	2596.64	I
100	2634.78	II
8	2702.63	I
18	2771.36	II

Ba I and II

Intensity	Wavelength	
15	2785.28	I
100 r	3071.58	I
10 h	3108.21	I
8	3132.60	I
8 h	3135.72	I
10	3137.70	I
10	3155.34	I
10	3155.67	I
12	3158.05	I
12 h	3158.54	I
25	3165.60	I
15 h	3173.69	I
30	3183.16	I
15	3183.96	I
10	3193.91	I
25 h	3203.70	I
30	3221.63	I
40	3222.19	I
50	3261.96	I
60 r	3262.34	I
40	3281.50	I
15	3281.77	I
50	3322.80	I
80 h	3356.80	I
60 r	3377.08	I
20	3377.39	I
70 r	3420.32	I
25	3421.01	I
30 h	3421.48	I
40	3463.74	I
200 r	3501.11	I
80 h	3524.97	I
30 h	3531.35	I
80 h	3544.66	I
20 h	3547.68	I
100	3552.45	II
200	3567.73	II
100	3576.28	II
30	3577.62	I
80 h	3579.67	I
200	3596.57	II
40	3630.64	I
40 h	3636.83	I
20 h	3688.47	I
400	3735.75	II
200	3816.69	II
200	3842.80	II
100	3854.76	II
20	3889.33	I
1400 l	3891.78	II
20	3892.65	I
40	3909.91	I
500	3914.73	II
50	3935.72	I
20	3937.87	I
200	3939.67	II
500	3949.51	II
80	3993.40	I
30	3995.66	I
300	4036.26	II
200	4083.77	II
30 h	4084.86	I
1500 h	4130.66	II
20	4132.43	I
200	4166.00	II
500	4216.04	II
800	4267.95	II
100	4283.10	I
300	4287.80	II

Ba I and II

Intensity	Wavelength	
200	4297.60	II
800	4309.32	II
20 h	4323.00	I
600	4325.73	II
200	4326.74	II
300	4329.62	II
80	4350.33	I
60	4402.54	I
400	4405.23	II
40	4431.89	I
60 h	4488.98	I
50 h	4493.64	I
40	4505.92	I
200	4509.63	II
60 h	4523.17	I
130	4524.93	II
65000	4554.03	II
40	4573.85	I
80	4579.64	I
30	4599.75	I
20 h	4619.92	I
25 h	4628.33	I
300	4644.10	II
30	4673.62	I
35	4691.62	I
20	4700.43	I
800	4708.94	II
40	4726.44	I
800	4843.46	II
300	4847.14	II
200	4850.84	II
30 h	4877.65	I
400	4899.97	II
15	4902.90	I
20000	4934.09	II
8	4947.35	I
1000	4957.15	II
300	4997.81	II
1000	5013.00	II
20 h	5159.94	I
20	5267.03	I
800	5361.35	II
1000	5391.60	II
200	5421.05	II
100	5424.55	I
200	5428.79	II
300	5480.30	II
200	5519.05	I
1000 r	5535.48	I
20 h	5620.40	I
10	5680.18	I
400	5777.62	I
800	5784.18	II
100	5800.23	I
20	5805.69	I
150	5826.28	I
2800	5853.68	II
15	5907.64	I
100	5971.70	I
800	5981.25	II
100	5997.09	I
300	5999.85	II
100	6019.47	I
200	6063.12	I
300	6110.78	I
400	6135.83	II
20000	6141.72	II
150	6341.68	I
500	6378.91	II

Ba I and II

Intensity	Wavelength	
90	6450.85	I
150	6482.91	I
12000	6496.90	II
300	6498.76	I
150	6527.31	I
3000	6595.33	I
150	6654.10	I
1500	6675.27	I
1800	6693.84	I
1000	6769.62	II
600	6865.69	I
300 h	6867.85	I
1000	6874.09	II
6000	7059.94	I
2400 h	7120.33	I
600	7195.24	I
600 h	7228.84	I
3000	7280.30	I
1200	7392.41	I
300	7417.53	I
900 h	7459.78	I
600	7488.08	I
450 h	7636.90	I
600 h	7642.91	I
1800	7672.09	I
1200	7780.48	I
180 h	7839.57	I
1500	7905.75	I
600	7911.34	I
900 h	8210.24	I
1800 h	8559.97	I
100	8710.74	II
100	8737.71	II
300 h	8799.76	I
300	8860.98	I
450	8914.99	I
300	9219.69	I
300	9308.08	I
300 h	9324.58	I
1500	9370.06	I
300	9455.92	I
450	9589.37	I
900	9608.88	I
300 h	9645.72	I
1500 h	9830.37	I
900	10001.08	I
600	10032.10	I
1200 h	10233.23	I
300	10471.26	I
120 h	10791.25	I
180 h	11012.69	I
150 h	11114.42	I
240	11303.04	I
120 h	11697.45	I
120	13207.30	I
120	13810.50	I
120	14077.90	I
120	15000.40	I
120	20712.00	I
150	25515.70	I
150	29223.90	I

Ba III

Ref. 111 - J.J.W.

Vacuum

5	403.82	III
2	407.12	III
7	420.12	III
4	423.84	III

Ba III

Intensity	Wavelength	
9	448.95	III
8	456.96	III
14	555.48	III
14	587.57	III
18	647.27	III
9	653.36	III
15	743.12	III
12	1097.41	III
15	1113.67	III
11	1116.01	III
14	1133.05	III
12	1151.76	III
12	1170.62	III
13	1207.29	III
11	1218.92	III
12	1224.55	III
12	1288.53	III
11	1299.18	III
11	1307.40	III
12	1308.87	III
12	1315.72	III
12	1334.01	III
11	1354.71	III
11	1369.53	III
11	1416.61	III
12	1478.85	III
12	1510.68	III
12	1514.22	III
12	1565.61	III
12	1566.12	III
12	1574.55	III
12	1596.80	III
12	1610.95	III
12	1615.78	III
12	1711.53	III
12	1861.74	III
12	1883.92	III
11	1974.76	III
	Air	
10	2001.30	III
15	2008.40	III
13	2022.45	III
10	2038.84	III
12	2070.43	III
12	2071.68	III
10	2076.00	III
12	2081.35	III
10	2134.87	III
16	2156.37	III
10	2160.76	III
20	2230.33	III
30	2280.68	III
35	2323.51	III
60	2331.10	III
25	2476.73	III
25	2505.07	III
40	2512.28	III
40	2523.83	III
25	2530.92	III
50	2559.54	III
25	2570.48	III
40	2681.89	III
30	2745.78	III
25	2938.95	III
25	2960.05	III
30	2962.48	III
20	3014.22	III
30	3043.42	III
40	3079.14	III

Ba III

Intensity	Wavelength	
30	3103.92	III
30	3119.22	III
30	3152.70	III
25	3195.17	III
25	3235.04	III
25	3281.65	III
20	3286.79	III
50	3368.18	III
30	3369.68	III
25	3649.18	III
25	3926.85	III
25	3993.06	III
18 p	4053.71	III
15	4697.44	III
10	5049.55	III
10	5097.54	III
12 p	5102.25	III
10	5134.54	III
10	5998.00	III
13	6101.99	III
10	6377.11	III
10	6383.76	III
8	6526.17	III
8	7095.49	III
8	8308.69	III
8	9521.76	III

Ba IV

Ref. 78 – J.J.W.

Vacuum

40000	794.89	IV
50000	923.74	IV

BERKELIUM (Bk)

Z = 97

Bk I and II

Refs. 53,331 – J.G.C.

Air

10000 s	2748.02	II
10000 s	2827.57	II
10000 l	2872.11	II
10000 s	2878.57	II
10000 l	2884.77	II
10000 s	2889.80	II
10000 s	2893.66	II
10000 l	2910.65	II
10000 s	2926.49	
10000 s	2927.91	
10000 l	2941.71	II
10000 l	2951.76	II
10000 l	2969.13	II
10000 l	2987.76	II
10000 l	3178.47	II
10000	3239.72	I
10000 s	3247.26	II
10000	3252.19	I
10000 s	3263.47	II
10000 l	3288.75	I
10000	3289.35	I
10000 s	3302.35	II
10000	3335.26	I
10000 s	3387.45	II
10000	3408.28	I
10000 l	3412.13	II
10000	3426.95	I
10000 l	3432.62	I
10000 l	3437.47	I
10000	3442.66	I

Bk I and II

Intensity	Wavelength	
10000 l	3453.90	I
10000 s	3461.24	II
10000 s	3464.13	II
10000 s	3472.02	II
10000 s	3477.62	II
10000	3528.72	I
10000 l	3531.40	I
10000 l	3535.73	I
10000 s	3542.19	II
10000	3553.60	I
10000 s	3555.88	I
10000	3556.52	I
10000	3565.41	
10000 l	3567.25	II
10000	3590.32	I
10000	3595.88	I
10000	3601.12	I
10000 s	3603.20	II
10000	3604.78	
10000 l	3608.49	
10000	3609.61	
10000	3611.03	
10000 l	3611.93	
10000	3613.91	
10000	3616.62	
10000	3619.37	
10000 s	3621.81	
10000	3627.61	I
10000	3633.28	
10000 l	3637.05	I
10000	3640.26	I
10000 s	3640.93	II
10000 l	3675.59	I
10000 s	3681.22	II
10000 l	3684.43	I
10000 s	3685.21	I
10000 l	3686.74	I
10000	3692.73	I
10000	3695.37	I
10000	3703.28	I
10000 s	3704.02	I
10000	3705.26	I
10000 s	3711.14	II
10000	3712.93	I
10000	3725.39	I
10000	3739.92	I
10000	3743.05	I
10000	3745.40	I
10000	3750.08	I
10000	3751.91	I
10000	3757.35	I
10000	3757.85	I
10000 s	3771.06	II
10000	3780.72	I
10000	3781.17	I
10000	3785.38	I
10000	3788.21	I
10000	3791.42	I
10000	3796.21	I
10000	3797.12	
10000	3798.63	I
10000	3801.08	II
10000 s	3802.35	I
10000	3802.47	I
10000	3815.29	I
10000 s	3823.10	II
10000 s	3824.08	II
10000	3825.19	I
10000 s	3825.84	II

Bk I and II

Intensity	Wavelength	
10000	3827.41	I
10000	3830.55	I
10000 l	3831.57	II
10000 s	3833.48	
10000 s	3835.97	II
10000	3842.19	I
10000 l	3846.62	I
10000	3847.63	I
10000	3855.03	I
10000 l	3859.89	II
10000 l	3877.94	II
10000	3880.11	I
10000 l	3882.60	I
10000 l	3894.55	II
10000 s	3906.09	II
10000 l	3912.16	II
10000 l	3916.37	II
10000	3921.42	I
10000 l	3928.05	II
10000 l	4147.13	II
10000 s	4189.69	II
10000 s	4197.44	II
10000 l	4329.58	I
10000	4351.50	I
10000	4363.64	I
10000	4423.01	I
10000	4466.46	I
10000	4685.70	
10000 l	4765.40	
10000 s	5056.73	I
10000 l	5118.24	I
10000 s	5135.53	II
10000	5170.61	I
10000	5197.55	I
10000	5212.53	I
10000	5271.95	I
10000	5392.03	I
10000	5394.24	I
10000 l	5404.62	I
10000	5449.63	I
10000 l	5467.47	I
10000 s	5484.58	I
10000	5512.22	II
10000 l	5537.93	I
10000 l	5556.80	I
10000 s	5557.09	I
10000	5581.21	I
10000 l	5656.54	I
10000	5659.03	I
10000	5702.24	I
10000	5910.71	I
10000 l	7040.85	I
10000	7107.85	I
10000 l	7176.22	I
10000	7249.26	
10000	7252.50	I
10000 l	7257.21	I
10000	7306.94	I
10000	7394.26	
10000 l	7511.26	I
10000	7551.12	I
10000	7579.77	I
10000 l	7729.93	I
10000 s	7903.90	I
10000 s	9319.30	I
10000 s	9429.13	I
10000 l	9801.18	I
10000 l	9862.39	II
10000 l	9879.29	I

Bk I and II		
Intensity	Wavelength	
10000 l	9892.38	I
10000	10126.20	I
10000 l	10186.58	I
10000	10292.44	I
10000 l	10527.71	I
10000 l	10570.53	I
10000 l	11293.14	I
10000 l	11500.30	I
10000 s	11575.34	I
10000 s	11793.09	I
10000 s	12159.05	I
10000	13061.13	I
10000	13498.36	I
10000 s	14196.93	I
10000	15136.10	I
10000	18352.31	
10000 l	19273.87	I
10000 s	19653.22	I
10000 s	23902.85	I
10000 s	24192.62	I

BERYLLIUM (Be)

Z = 4

Be I and II

Refs. 15,114,115,134,135, 198,335 - J.O.S.

Vacuum

	82.58	II
	83.66	II
	89.16	I
	89.80	II
	90.04	II
	90.21	I
	90.67	I
	91.06	II
	91.36	II
	91.74	II
	92.19	I
	92.61	II
	93.14	II
	93.42	II
	93.93	II
	94.78	II
	95.76	II
	96.29	I
	97.24	I
	97.44	I
	97.86	I
	97.97	I
	98.12	I
	98.37	I
	98.66	I
	98.94	I
	99.19	I
	100.86	I
	101.20	I
	102.13	I
	102.49	II
	104.40	II
	104.67	I
	105.80	I
	107.26	I
	107.38	I
	714.0	II
5	725.71	II
5	743.58	II
8	775.37	II

Be I and II		
Intensity	Wavelength	
20	842.06	II
	865.3	II
2	925.25	II
10	943.56	II
10	973.27	II
	981.4	II
	1020.1	II
8	1026.93	II
5	1036.32	II
15	1048.23	II
20	1143.03	II
	1155.9	II
60	1197.19	II
	1426.12	I
	1491.76	I
20	1512.30	II
60	1512.43	II
100	1661.49	I
15	1776.12	II
20	1776.34	II
	1907.	I
	1909.0	II
	1912.	I
	1919.	I
5	1929.67	I
10	1943.68	I
	1956.	I
50	1964.59	I
5	1985.13	I
	1997.95	I
	1997.98	I
60	1998.01	I
	Air	
	2033.25	I
	2033.28	I
	2033.38	I
50	2055.90	I
100	2056.01	I
10	2125.57	I
20	2125.68	I
25	2145.	I
55	2174.99	I
55	2175.10	I
	2273.5	II
	2324.6	II
	2337.0	I
950	2348.61	I
20	2350.66	I
60	2350.71	I
200	2350.83	I
2	2413.34	II
16	2413.46	II
20	2453.84	II
	2480.6	I
35	2494.54	I
35	2494.58	I
100	2494.73	I
16	2507.43	II
5	2617.99	II
20	2618.13	II
100	2650.45	I
60	2650.55	I
200	2650.62	I
60	2650.69	I
100	2650.76	I
5	2697.46	II
20	2697.58	II
20	2728.88	II
30	2738.05	I

Be I and II		
Intensity	Wavelength	
	2764.2	II
20	2898.13	I
10	2898.19	I
20	2898.25	I
30	2986.06	I
10	2986.42	I
60	3019.33	I
30	3019.49	I
30	3019.53	I
20	3019.60	I
10	3046.52	II
30	3046.69	II
	3090.3	I
10	3110.81	I
10	3110.92	I
20	3110.99	I
	3120.	I
480	3130.42	II
320	3131.07	II
	3136.	I
	3150.	I
	3160.6	I
	3163.	I
	3168.	I
	3180.7	II
	3187.	I
20	3193.81	I
20	3197.10	II
30	3197.15	II
20	3208.60	I
	3220.	I
60	3229.63	I
2	3233.52	II
10	3241.62	II
30	3241.83	II
15	3269.02	I
100	3274.58	II
30	3274.67	II
30	3282.91	I
30	3321.01	I
30	3321.09	I
220	3321.34	I
20	3345.43	I
60	3367.63	I
	3405.6	II
5	3451.37	I
300	3455.18	I
20	3476.56	I
300	3515.54	I
10	3555.	I
100	3736.30	I
700	3813.45	I
40	3865.13	I
80	3865.42	I
1	3865.51	I
6	3865.72	I
100	3866.03	I
100	4253.05	I
60	4253.76	I
300	4360.66	II
500	4360.99	II
400	4407.94	I
	4526.6	I
	4548.	I
12	4572.66	I
700	4673.33	II
1000	4673.42	II
6	4709.37	I
200	4828.16	II

Be I and II		
Intensity	Wavelength	
40	4849.16	I
2 h	4858.22	II
80	5087.75	I
8	5218.12	II
20	5218.33	II
3	5255.86	II
64	5270.28	II
500	5270.81	II
20	5403.04	II
20	5410.21	II
	5558.	I
10	6229.11	I
16	6279.43	II
30	6279.73	II
30	6473.54	I
60	6547.89	II
60	6558.36	II
30	6564.52	I
2 h	6636.44	II
1	6756.72	II
2	6757.13	II
30	6786.56	I
1 h	6884.22	I
6 h	6884.44	I
100	6982.75	I
6 h	7154.40	I
40 h	7154.65	I
100	7209.13	I
3	7401.20	II
2	7401.43	II
10	7551.90	I
10 h	7618.68	I
20 h	7618.88	I
60	8090.06	I
5 h	8158.99	I
10 h	8159.24	I
4	8254.07	I
10 h	8287.07	I
30	8547.36	I
60	8547.67	I
300	8801.37	I
6	8882.18	I
40	9190.45	I
20 h	9243.92	I
1 h	9343.89	II
40	9392.74	I
2	9476.43	II
16	9477.03	II
20	9847.32	I
10 h	9895.63	I
20 h	9895.96	I
80	9939.78	I
16	10095.52	II
20	10095.73	II
60	10119.92	II
80	10331.03	I
30	11066.46	I
	11173.	II
1	11173.73	II
120	11496.39	I
2 h	11625.16	II
	11659.	II
2	11660.25	II
100	12095.36	II
30	12098.18	II
100	14643.92	I
60	14644.75	I
200	16157.72	I
80	17855.38	I

Be I and II

Intensity	Wavelength	
120	17856.63	I
100	18143.54	I
160	31775.05	I
200	31778.70	I

Be III

Refs. 73,102,175 - J.O.S.

Vacuum

1 h	76.10	III
2	76.48	III
3	78.53	III
4	78.66	III
1 h	78.92	III
5	81.89	III
10	82.38	III
20	83.20	III
30	84.76	III
50	88.31	III
100	100.25	III
3	509.99	III
2	549.31	III
6	582.08	III
4	661.32	III
8	675.59	III
4	725.59	III
7	746.23	III
2	767.75	III
1	1114.69	III
2	1213.12	III
1	1214.32	III
2	1362.25	III
1	1401.52	III
10	1421.26	III
5	1422.86	III
1	1435.17	III
2	1440.77	III
2 h	1754.69	III
3	1917.03	III
60 h	1954.97	III

Air

75 h	2076.94	III
60 h	2080.38	III
25	2118.56	III
15 h	2122.27	III
15 h	2127.20	III
5	2137.25	III
5	2191.57	III
100	3720.36	III
	3720.92	III
	3722.98	III
90 h	4249.14	III
2	4485.52	III
100 h	4487.30	III
1	4495.09	III
140 h	4497.8	III
140 h	6142.01	III

Be IV

Ref. 272 - J.O.S.

Vacuum

	58.13	IV
	58.57	IV
	59.32	IV
	60.74	IV
	64.06	IV
	75.93	IV

BISMUTH (Bi)

Z = 83

Bi I and II

Refs. 1,357,358,359 - C.H.C.

Vacuum

15	1058.88	II
20	1085.47	II
10	1099.20	II
8	1163.19	II
8	1167.06	II
10	1225.43	II
15	1232.78	II
10	1241.05	II
10	1265.35	II
15	1283.73	II
10	1306.18	II
20	1325.46	II
20	1329.47	II
20	1350.07	II
25	1372.61	II
15	1376.02	II
20	1393.92	II
45	1436.83	II
25	1447.94	II
50	1455.11	II
25	1462.14	II
35	1486.93	II
20	1502.50	II
40	1520.57	II
40	1533.17	II
30	1536.77	II
35	1538.06	II
20	1563.67	II
40	1573.70	II
60	1591.79	II
25	1601.58	II
40	1609.70	II
40	1611.38	II
20	1652.81	II
20	1749.29	II
80	1777.11	II
60	1787.47	II
70	1791.93	II
70	1823.80	II
100	1902.41	II
9000	1954.53	I
7000	1960.13	I
25	1989.35	II

Air

7000	2021.21	I
9000	2061.70	I
45 h	2068.9	II
4600	2110.26	I
2500	2133.63	I
15	2143.40	II
15	2143.46	II
60	2186.9	II
40 h	2214.0	II
360	2228.25	I
1700	2230.61	I
340	2276.58	I
16	2368.12	II
12	2368.25	II
190	2400.88	I
10	2501.0	II
25	2515.69	I
70	2524.49	I
20 h	2544.5	II
700	2627.91	I

Bi I and II

Intensity	Wavelength	
12	2693.0	II
280 c	2696.76	I
20	2713.3	II
140 d	2730.50	I
360	2780.52	I
15	2803.42	II
11	2803.70	II
12	2805.3	II
140 c	2809.62	I
4000	2897.98	I
15	2936.7	II
3200	2938.30	I
20	2950.4	II
12	2963.4	II
2800	2989.03	I
700	2993.34	I
2400	3024.64	I
60	3034.87	I
9000 c	3067.72	I
140	3076.66	I
550 c	3397.21	I
10	3430.83	II
12	3431.23	II
500 c	3510.85	I
380 c	3596.11	I
12	3654.2	II
70 h	3792.5	II
12	3811.1	II
20	3815.8	II
10	3845.8	II
30	3863.9	II
40 h	4079.1	II
10	4097.2	II
140	4121.53	I
140	4121.86	I
75 h	4259.4	II
25	4272.0	II
70 h	4301.7	II
12 h	4339.8	II
25 h	4340.5	II
12 h	4379.4	II
25 h	4476.8	II
60 h	4705.3	II
600 c	4722.52	I
30	4730.3	II
20	4749.7	II
12	4908.2	II
10	4916.6	II
12	4969.7	II
20	4993.6	II
10	5091.6	II
50 h	5124.3	II
60 h	5144.3	II
20	5201.5	II
75 h	5209.2	II
40 h	5270.3	II
10	5397.8	II
10 c	5552.35	I
3	5599.41	I
20	5655.2	II
40 h	5719.2	II
6	5742.55	I
12	5818.3	II
20	5860.2	II
20	5973.0	II
15	6059.1	II
15	6128.0	II
6	6134.82	I
3	6475.73	I

Bi I and II

Intensity	Wavelength	
3	6476.24	I
15	6497.7	II
10	6577.2	II
40 h	6600.2	II
50 h	6808.6	II
4 h	6991.12	I
12	7033.	II
2	7036.15	I
10 h	7381.	II
2	7502.33	I
10 h	7637.	II
10	7750.	II
3	7838.70	I
2	7840.33	I
20	7965.	II
12 h	8050.	II
15	8328.	II
15	8388.	II
30	8532.	II
2	8544.54	I
1	8579.74	I
25	8653.	II
2	8754.88	I
3	8761.54	I
25	8863.	II
2	8907.81	I
2000 d	9657.04	I
40	9827.78	I
20	10104.5	I
15	10138.8	I
20	10300.6	I
20	10536.19	I
50	11072.44	I
15	11551.6	I
1500 d	11710.37	I
40	11999.49	I
200	12165.08	I
10	12374.64	I
200	12690.04	I
100	12817.8	I
200	14330.5	I
50	16001.5	I
60	22551.6	I

Bi III

Ref. 359 - C.H.C.

Vacuum

1	590.73	III
5	670.76	III
4	775.16	III
6	803.65	III
7	920.93	III
6	925.48	III
25	1039.99	III
50 h	1045.76	III
30	1051.81	III
20	1139.01	III
15	1145.91	III
50	1224.64	III
40	1326.84	III
60	1346.12	III
35	1423.33	III
35	1423.52	III
60 h	1461.00	III
60 h	1606.40	III
20 h	1691.5	III
20	1834.32	III
10	1863.9	III
10	1912.12	III

Bi III

Intensity	Wavelength	
	Air	
10	1988.26	III
20	2020.75	III
20	2021.15	III
10	2073.22	III
14	2073.37	III
15	2103.42	III
30	2213.55	III
75 h	2414.6	III
10	2437.6	III
30 h	2847.4	III
80 h	2855.6	III
35	3115.0	III
40 h	3451.0	III
40	3473.8	III
35	3485.5	III
15	3540.8	III
45	3613.4	III
50	3695.32	III
50	3695.68	III
12	4224.6	III
25	4327.8	III
30	4560.84	III
30	4561.54	III
40 h	4797.4	III
45 h	5079.3	III
12	6623.4	III
10 h	7381.	III
12	7551.	III
25	7598.	III
10 h	7637.	III
40	8008.	III
50	8070.	III
20	8100.	III
15	8671.	III
20	8934.	III

Bi IV

Ref. 360 - C.H.C.

	Vacuum	
6	420.7	IV
6	431.2	IV
6	790.5	IV
6	790.6	IV
8	792.5	IV
10	820.3	IV
9	822.9	IV
12	824.9	IV
15	872.6	IV
8	876.8	IV
9	916.7	IV
12	923.9	IV
15	943.3	IV
9	967.6	IV
8	968.8	IV
8	989.8	IV
24	1103.4	IV
7	1128.8	IV
6	1138.6	IV
6	1139.8	IV
7	1149.7	IV
60	1317.0	IV
30	1910.0	IV
	Air	
30	2093.	IV
100	2311.	IV
100	2326.	IV
100	2376.	IV
100	2629.	IV

Bi IV

Intensity	Wavelength	
100	2677.	IV
100	2767.	IV
100	2772.	IV
100	2786.	IV
100	2842.	IV
100	2924.	IV
100	2933.	IV
100	2936.	IV
100	3012.	IV
100	3042.	IV
100	3239.	IV
100	3643.	IV
100	3682.	IV
100	3734.	IV
100	3868.	IV
30	4342.	IV
30	5347.	IV

Bi V

Ref. 361 - C.H.C.

	Vacuum	
1	355.77	V
1	369.52	V
1	429.78	V
1	435.63	V
2	488.39	V
1	492.72	V
3	563.62	V
2	678.87	V
6	686.88	V
1	706.54	V
5	730.71	V
10	738.17	V
6	849.86	V
5	855.68	V
15 d	864.45	V
6	880.17	V
6	929.81	V
15 d	1139.46	V

BORON (B)

Z = 5

B I and II

Refs. 66,104,171,222 - R.L.K.

	Vacuum	
70	693.95	II
40	731.36	II
40	731.44	II
110	882.54	II
110	882.68	II
40	984.67	II
110	1081.88	II
110	1082.07	II
110	1230.16	II
220	1362.46	II
70	1600.46	I
120	1600.73	I
160	1623.58	II
110	1623.77	II
220	1624.02	II
70	1624.16	II
160	1624.34	II
100	1663.04	I
150	1666.87	I
200	1667.29	I
150	1817.86	I
200	1818.37	I

B I and II

Intensity	Wavelength	
300	1825.91	I
300	1826.41	I
110	1842.81	II
	Air	
250	2066.38	I
250	2066.65	I
100	2066.93	I
300	2067.19	I
500	2088.91	I
500	2089.57	I
70	2220.30	II
40	2323.03	II
40	2328.67	II
40	2393.20	II
220	2395.05	II
40	2459.69	II
40	2459.90	II
1000	2496.77	I
1000	2497.73	I
160	2918.08	II
110	3032.26	II
70	3179.33	II
110	3323.18	II
110	3323.60	II
450	3451.29	II
285	4121.93	II
110	4194.79	II
110	4472.10	II
110	4472.85	II
70	4784.21	II
110	4940.38	II
110	6080.44	II
70	6285.47	II
70	7030.20	II
40	7031.90	II
70	8668.57	I
20	8667.22	I
800	11660.04	I
570	11662.47	I
125	15629.08	I
200	16240.38	I
250	16244.67	I
235	18994.33	I

B III

Refs. 69,221 - R.L.K.

	Vacuum	
150	518.24	III
75	518.27	III
40	411.80	III
20	510.77	III
40	510.85	III
110	677.00	III
160	677.14	III
40	758.48	III
70	758.67	III
20	1953.83	III
	Air	
550	2065.78	III
450	2067.23	III
160	2077.09	III
40	2234.09	III
70	2234.59	III
40	4242.98	III
70	4243.61	III
220	4487.05	III
360	4497.73	III
110	7835.25	III
70	7841.41	III

B IV

Ref. 74 - R.L.K.

Intensity	Wavelength	
	Vacuum	
10	52.68	IV
30	60.31	IV
160	344.0	IV
450	385.0	IV
285	418.7	IV
70	1112.2	IV
450	1168.9	IV
70	1170.9	IV
	Air	
70	2524.7	IV
160	2530.3	IV
450	2821.68	IV
70	2824.57	IV
285	2825.85	IV

B V

Ref. 94 - R.L.K.

	Vacuum	
	41.00	V
30	48.59	V
	194.37	V
	262.37	V
	512.53	V
	749.74	V

BROMINE (Br)

Z = 35

Br I and II

Refs. 122,124,240,248,316 - G.V.S.

	Vacuum	
300	711.68	II
250	815.48	II
350	856.19	II
1000	889.23	II
500	896.64	II
500	905.99	II
300	922.56	II
1000	948.97	II
500	984.93	II
500	1012.10	II
1000	1015.54	II
500	1037.02	II
1000	1049.00	II
450	1064.76	II
500	1071.87	II
250	1101.50	I
300	1134.59	I
250	1136.29	I
250	1177.23	I
400	1178.90	I
1000	1189.28	I
250	1189.38	I
1000	1189.50	I
500	1198.37	I
800	1209.76	I
1000	1210.73	I
750	1216.01	I
1000	1221.13	I
900	1221.87	I
1000	1223.24	I
1200	1224.41	I
1200	1226.90	I
750	1228.05	I

Br I and II

Intensity	Wavelength	
7500	1232.43	I
1200	1243.90	I
800	1249.59	I
1500	1251.66	I
1000	1255.80	I
1500	1259.20	I
1200	1261.66	I
1200	1266.20	I
1000	1279.48	I
1000	1286.26	I
3000	1309.91	I
3000	1316.74	I
1000	1317.37	I
2000	1317.70	I
12000	1384.60	I
3000	1449.90	I
50000	1488.45	I
30000	1531.74	I
25000	1540.65	I
30000	1574.84	I
20000	1576.39	I
25000	1582.31	I
75000	1633.40	I
	Air	
350	2285.17	II
350	2287.60	II
500 h	2317.30	II
400	2336.93	II
350	2386.45	II
500	2386.70	II
300	2388.69	II
450	2388.96	II
500	2389.69	II
350	2392.21	II
400	2392.42	II
300	2488.50	II
300 h	2495.22	II
450	2521.70	II
400	2541.48	II
400	2556.92	II
350	2690.17	II
400	2713.77	II
350 h	2746.52	II
300 h	2807.55	II
400 h	2893.40	II
400 h	2917.18	II
400 h	2967.21	II
500 h	2972.26	II
300	2981.86	II
300 h	2985.87	II
300 h	2986.53	II
300 h	3016.48	II
350	3423.82	II
300 h	3606.80	II
350	3714.30	II
1200	3815.65	I
350	3834.69	II
300	3871.21	II
400	3891.63	II
300	3901.24	II
300	3914.20	II
500	3914.38	II
350	3919.51	II
400	3924.09	II
300	3929.55	II
350	3939.69	II
350	3950.61	II
500	3980.38	II
1500	3992.36	I

Br I and II

Intensity	Wavelength	
300	4024.04	II
300	4135.66	II
300	4140.20	II
400	4179.63	II
300	4193.45	II
1000	4223.89	II
300	4236.89	II
300	4291.39	II
2000	4365.14	I
1000	4365.60	II
1500	4425.14	I
10000	4441.74	I
10000	4472.61	I
20000	4477.72	I
1000	4490.42	I
3000	4513.44	I
15000	4525.59	I
300	4529.60	II
500	4542.92	II
3000	4575.74	I
300	4601.36	II
2500	4614.58	I
350	4622.70	II
300	4642.02	II
300	4651.98	II
500	4678.70	II
400	4693.17	II
500	4704.85	II
350	4719.76	II
400	4720.36	II
300	4728.20	II
300	4735.41	II
400	4742.64	II
2500	4752.28	I
350	4766.00	II
400	4779.40	II
4000	4780.31	I
1600	4785.19	I
500	4785.50	II
300	4802.33	II
500	4816.70	II
300	4818.46	II
350	4844.81	II
350	4848.75	II
400	4921.12	II
400	4928.79	II
450	4930.66	II
300	4945.51	II
4000	4979.76	I
300	5038.74	II
300	5054.64	II
400	5164.38	II
300	5180.01	II
500	5182.35	II
300	5193.90	II
500	5238.23	II
300	5272.68	II
350	5304.10	II
400	5330.57	II
500	5332.05	II
1200	5395.48	I
400	5422.78	II
350	5424.99	II
300	5435.07	II
1200	5466.22	I
350	5478.47	II
300	5488.79	II
300	5495.06	II
500	5506.69	II

Br I and II

Intensity	Wavelength	
350	5589.94	II
300	5718.71	II
300	5830.78	II
1800	5852.08	I
1600	5940.48	I
2400	6122.14	I
40000	6148.60	I
300	6161.74	II
2000	6177.39	I
1500	6335.48	I
60000	6350.73	I
400	6352.94	II
2500	6410.32	I
1800	6483.56	I
1000	6514.62	I
20000	6544.57	I
1500	6548.09	I
50000 c	6559.80	I
1000	6571.31	I
1800	6579.14	I
20000	6582.17	I
1500	6620.47	I
50000 c	6631.62	I
20000	6682.28	I
10000	6692.13	I
8000	6728.28	I
2000	6760.06	I
2000	6779.48	I
2200	6786.74	I
6500	6790.04	I
1600 c	6791.48	I
1800	6861.15	I
10000	7005.19	I
2000	7260.45	I
10000	7348.51	I
40000	7512.96	I
1600	7591.61	I
1800	7595.07	I
2000	7616.41	I
30000	7803.02	I
1200	7827.23	I
2500 s	7881.45	I
2500	7881.57	I
2500	7925.81	I
30000 c	7938.68	I
3000	7947.94	I
3000	7950.18	I
8000	7978.44	I
10000	7978.57	I
30000	7989.94	I
2000	8026.35	I
2500	8026.54	I
30000	8131.52	I
1000 c	8152.65	I
10000	8153.75	I
25000	8154.00	I
5000	8246.86	I
15000	8264.96	I
75000 c	8272.44	I
20000	8334.70	I
10000	8343.70	I
1200	8384.04	I
40000	8446.55	I
4000	8477.45	I
1500	8513.38	I
1000	8557.73	I
1000	8566.28	I
20000	8638.66	I
4000	8698.53	I

Br I and II

Intensity	Wavelength	
10000 c	8793.47	I
15000	8819.96	I
25000	8825.22	I
4000	8888.98	I
30000	8897.62	I
6000	8932.40	I
1800	8949.39	I
9000	8964.00	I
350	9024.42	II
30000	9166.06	I
15000	9173.63	I
20000	9178.16	I
40000	9265.42	I
15000	9320.86	I
300	9434.04	II
6000	9793.48	I
10000	9896.40	I
3000	10140.08	I
6000	10237.74	I
1000	10299.62	I
1500	10377.65	I
30000	10457.96	I
1000	10742.14	I
3000	10755.92	I
1700	13217.17	I
1800	14354.57	I
1250	14888.70	I
1800	16731.19	I
1200	18568.31	I
3500	19733.62	I
1000	20281.73	I
1000	20624.67	I
1200	21787.24	I
4000	22865.65	I
1000	23513.15	I
500	28346.50	I
500	30380.85	I
600	31630.13	I
120	32693.90	I
150	34181.87	I
150	38345.75	I
120	39964.36	I

Br III

Refs. 246,250 - G.V.S.

Vacuum		
450	611.1	III
300	620.4	III
500	665.54	III
500	677.19	III
300	677.8	III
450	687.68	III
400	690.2	III
350	696.99	III
300	727.0	III
300	736.4	III
250	769.63	III
250	817.79	III
350	949.0	III
400	960.4	III
450	984.9	III
250	1313.5	III
250	1402.9	III
	Air	
400 h	2293.44	III
300	2313.29	III
300	2462.39	III
300	2482.60	III
350	2499.25	III

Br III

Intensity	Wavelength	
350	2529.49	III
350 h	2551.09	III
350 h	2570.83	III
300 h	2573.17	III
400 h	2584.99	III
500	2589.14	III
300 h	2594.48	III
400 h	2595.98	III
450 h	2606.20	III
350 h	2608.15	III
500 h	2613.13	III
350 h	2616.26	III
500 h	2626.52	III
350 h	2629.23	III
350 h	2639.60	III
350 h	2671.53	III
350 h	2735.83	III
300	2770.50	III
300 h	2785.28	III
300	2804.16	III
400	2926.96	III
300	2936.22	III
350	2969.00	III
400	2994.04	III
500	3020.76	III
300	3033.63	III
350	3036.45	III
500	3074.42	III
350	3091.94	III
350	3117.29	III
300	3147.81	III
400	3174.08	III
300	3321.08	III
450	3333.07	III
500	3349.64	III
300	3385.25	III
450	3447.36	III
400	3487.58	III
300	3506.47	III
450	3517.36	III
500	3540.16	III
300	3551.08	III
500	3562.43	III
450	3600.71	III
250	3693.53	III
450	3820.26	III
200	3903.95	III
350	4506.55	III
200	4519.74	III
150	5175.87	III
100	5446.80	III
100	7192.8	III
100	7673.1	III

Br IV

Refs. 139,142,243,249 – G.V.S. Vacuum

700	379.73	IV
700	400.37	IV
1000	545.43	IV
1000	559.76	IV
1000	569.19	IV
1000	576.59	IV
1000	585.10	IV
1000	586.71	IV
1000	597.51	IV
1000	600.09	IV
1000	601.27	IV

Br IV

Intensity	Wavelength	
1000	607.03	IV
1000	617.85	IV
1000	619.87	IV
1000	630.14	IV
1000	642.23	IV
1000	661.53	IV
1000	683.51	IV
1000	697.72	IV
1000	715.39	IV
1000	731.00	IV
1000	800.12	IV
1000	813.66	IV
900	1274.82	IV
1000	1703.51	IV
	Air	
1000	2133.79	IV
1000	2145.02	IV
1000	2257.21	IV
1000	2272.73	IV
1000	2307.40	IV
1000	2408.16	IV
1000	2411.58	IV
700	2491.14	IV
1000	2581.19	IV
600	2661.40	IV
700	2820.87	IV
1000	2842.88	IV
1100 h	2907.71	IV
500	3041.18	IV
500	3380.56	IV

Br V

Ref. 42 – G.V.S. Vacuum

600	468.37	V
800	482.11	V
900	531.97	V
1000	547.90	V
700	549.77	V
800	621.03	V
800	632.22	V
700	645.44	V
400	652.64	V
800	657.54	V
800	679.62	V
700	812.95	V
1000	850.81	V
150	855.27	V
600	1041.60	V
1000	1069.15	V
500	1080.54	V
900	1112.13	V
1000	1143.56	V
150	1429.75	V
400	1442.60	V
150	1470.35	V

CADMIUM (Cd)

Z = 48

Cd I and II

Refs. 44,285,296 – R.D.C. Vacuum

100	1256.00	II
150	1296.43	II
100	1326.50	II
150	1370.91	II
200	1514.26	II
200	1571.58	II

Cd I and II

Intensity	Wavelength	
100	1668.60	II
50	1702.47	II
50	1724.41	II
100	1785.84	II
100	1827.70	II
300	1922.23	II
100	1943.54	II
40	1965.54	II
30	1986.89	II
200	1995.43	II
	Air	
100	2007.49	II
50	2032.45	II
75	2036.23	II
150	2096.00	II
1000 r	2144.41	II
50	2155.06	II
100	2187.79	II
1000	2194.56	II
1000	2265.02	II
1500 r	2288.022	I
1000	2312.77	II
200	2321.07	II
40	2376.82	II
50	2418.69	II
50	2469.73	II
40	2487.93	II
3	2491.00	I
40	2495.58	II
10	2508.91	I
50	2509.11	II
30	2516.22	II
15 h	2518.59	I
25 h	2525.196	I
50	2544.613	I
50	2551.98	II
25	2553.465	I
3	2565.789	I
500	2572.93	II
50	2580.106	I
3	2584.87	I
30	2592.026	I
25 h	2602.048	I
50	2628.979	I
40	2632.190	I
75	2639.420	I
40	2659.23	II
50 h	2660.325	I
25	2668.20	II
50	2672.62	II
100	2677.540	I
25	2677.748	I
50	2707.00	II
75	2712.505	I
50	2733.820	I
1000	2748.54	II
100 h	2763.894	I
50 h	2764.230	I
50	2774.958	I
30	2823.19	II
200	2836.900	I
25	2856.46	II
100	2868.180	I
200 r	2880.767	I
50 r	2881.224	I
200	2914.67	II
50	2927.87	II
200	2929.27	II
1000 r	2980.620	I

Cd I and II

Intensity	Wavelength	
200 r	2981.362	I
50	2981.845	I
50	3030.60	II
150	3080.822	I
25	3081.48	II
30	3082.593	I
100	3092.34	II
200	3133.167	I
50	3146.79	II
150	3250.33	II
300	3252.524	I
300	3261.055	I
50	3343.21	II
50	3385.49	II
30	3388.88	II
800	3403.652	I
50	3417.49	II
50	3442.42	II
100	3464.43	II
1000	3466.200	I
800	3467.655	I
25	3483.08	II
150	3495.44	II
25	3499.952	I
100	3524.11	II
100	3535.69	II
1000	3610.508	I
800	3612.873	I
60	3614.453	I
20	3649.558	I
10	3981.926	I
100	4029.12	II
200	4134.77	II
50	4141.49	II
100	4285.08	II
8	4306.672	I
100	4412.41	II
3	4412.989	I
1000	4415.63	II
30	4440.45	II
8	4662.352	I
200	4678.149	I
30	4744.69	II
300	4799.912	I
50	4881.72	II
50	5025.50	II
1000 h	5085.822	I
6	5154.660	I
100	5268.01	II
100	5271.60	II
1000	5337.48	II
1000	5378.13	II
200	5381.89	II
40	5843.30	II
50	5880.22	II
300	6099.142	I
100	6111.49	I
100	6325.166	I
30	6330.013	I
400	6354.72	II
500	6359.98	II
2000	6438.470	I
400	6464.94	II
25	6567.65	II
500	6725.78	II
100	6759.19	II
30	6778.116	I
50	7237.01	II
100	7284.38	II

Cd I and II

Intensity	Wavelength	
1000	7345.670	I
50	8066.99	II
5	8200.309	I
20	9292	I
15	11655	I
35	14491	I
80	15712	I
55 d	19125	I
25	24378	I
35	25455	I

Cd III

Ref. 296 - R.D.C.

Vacuum

8	677.39	III
15	684.58	III
10	720.70	III
5	1383.60	III
15	1392.10	III
10	1396.78	III
25	1416.28	III
5	1420.29	III
8	1420.54	III
5	1432.86	III
20	1446.08	III
25	1447.55	III
30	1455.74	III
8	1466.14	III
5	1471.97	III
15	1491.81	III
5	1511.01	III
10	1511.65	III
5	1513.13	III
10	1523.55	III
15	1528.40	III
30	1529.30	III
5	1532.10	III
50	1545.17	III
25	1547.57	III
10	1550.07	III
20	1550.45	III
15	1550.89	III
5	1552.18	III
5	1556.48	III
15	1560.66	III
5	1566.03	III
15	1568.98	III
10	1582.39	III
40	1601.59	III
20	1604.87	III
20	1606.64	III
10	1607.28	III
15	1608.91	III
10	1609.61	III
15	1612.51	III
15	1625.27	III
25	1628.54	III
20	1651.87	III
25	1655.63	III
30	1678.15	III
10	1699.70	III
40	1707.16	III
10	1721.93	III
40	1722.95	III
30	1725.66	III
25	1739.00	III
5	1745.69	III
40	1747.67	III
15	1748.15	III

Cd III

Intensity	Wavelength	
30	1768.82	III
40	1773.06	III
30	1789.19	III
75	1793.40	III
15	1796.10	III
5	1800.57	III
40	1823.41	III
50	1844.66	III
40	1851.13	III
20	1851.37	III
40	1855.85	III
200	1856.67	III
150	1874.08	III
15	1886.49	III
15	1903.48	III
25	1909.98	III
15	1910.57	III
10	1939.59	III
15	1988.81	III

Air

20	2000.60	III
15	2004.07	III
15	2016.12	III
40	2039.83	III
50	2045.61	III
10	2061.25	III
75	2087.91	III
10	2097.45	III
5	2100.47	III
50	2111.60	III
5	2188.13	III
5	2218.43	III
5	2224.43	III
7	2418.24	III
10	2426.36	III
25	2499.81	III
15	2618.81	III
5	2630.56	III
20	2766.99	III
30	2805.59	III
10	3035.72	III

Cd IV

Refs. 353,399 - R.D.C.

Vacuum

50	427.01	IV
20	437.88	IV
50	447.85	IV
60	480.90	IV
10	489.49	IV
70	493.00	IV
70	495.13	IV
70	498.14	IV
70	498.53	IV
80	504.09	IV
70	504.20	IV
70	504.50	IV
80	506.31	IV
60	508.01	IV
50	508.95	IV
70	509.55	IV
25	509.81	IV
70	511.40	IV
80	513.00	IV
70	514.50	IV
60	519.42	IV
15	520.97	IV
80	524.41	IV
70	524.47	IV

Cd IV

Intensity	Wavelength	
50	524.77	IV
70	525.10	IV
60	525.19	IV
70	527.07	IV
50	530.79	IV
80	531.09	IV
80	531.51	IV
70	534.29	IV
70	536.77	IV
50	537.24	IV
60	540.90	IV
70	541.74	IV
80	542.60	IV
80	546.55	IV
40	548.01	IV
20	548.33	IV
15	548.90	IV
25	551.27	IV
20	552.90	IV
60	553.06	IV
80	554.05	IV
25	560.26	IV
10	564.16	IV
60	567.01	IV
20	1062.23	IV
150	1118.16	IV
30	1126.00	IV
20	1134.08	IV
15	1139.04	IV
20	1154.64	IV
10	1155.73	IV
100	1164.65	IV
20	1165.78	IV
40	1167.30	IV
20	1179.73	IV
15	1183.07	IV
100	1183.40	IV
40	1194.13	IV
20	1195.63	IV
30	1196.47	IV
20	1198.93	IV
15	1215.38	IV
20	1223.52	IV
20	1246.06	IV
15	1246.56	IV
15	1249.94	IV
30	1266.47	IV
15	1274.41	IV
20	1285.63	IV
20	1287.58	IV
20	1299.46	IV
40	1304.36	IV
30	1306.07	IV
15	1316.89	IV
15	1321.85	IV
20	1325.55	IV
30	1340.97	IV
15	1346.15	IV
30	1354.78	IV
20	1358.11	IV
30	1362.55	IV
60	1370.48	IV
30	1380.98	IV
20	1397.65	IV
30	1403.68	IV
15	1406.58	IV
60	1418.89	IV
15	1429.83	IV
20	1447.54	IV

Cd IV

Intensity	Wavelength	
20	1452.63	IV
15	1465.97	IV
15	1466.67	IV
15	1482.95	IV
20	1491.79	IV
20	1570.20	IV
20	1598.73	IV
20	1600.42	IV
15	1622.87	IV

CALCIUM (Ca)

Z = 20

Ca I and II

Refs. 70,150,270 - J.J.W. and H.H.S.

Vacuum

24	1341.89	II
12	1342.54	II
20	1433.75	II
12	1432.50	II
20	1553.18	II
32	1554.64	II
4	1642.80	II
20	1643.77	II
36	1644.44	II
60	1649.86	II
32	1651.99	II
12	1673.86	II
20	1680.05	II
2	1680.13	II
8	1691.78	II
16	1698.18	II
20	1807.34	II
40	1814.50	II
4	1814.65	II
60	1840.06	II
40	1838.01	II
20	1843.09	II
40	1850.69	II

Air

	2103.24	II
	2112.76	II
	2113.15	II
	2128.75	II
	2131.51	II
	2132.30	II
2	2150.80	I
	2197.79	II
5	2200.73	I
	2208.61	II
6	2275.46	I
8	2398.56	I
7	2721.65	I
9	2994.96	I
8	2997.31	I
8	2999.64	I
9	3000.86	I
10	3006.86	I
9	3009.21	I
2	3024.94	I
2	3034.54	I
2	3045.74	I
3	3055.32	I
2	3071.57	I
2	3076.95	I
2	3080.79	I
2	3099.30	I

Ca I and II			Ca I and II			Ca I and II			Ca I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
10	3125.18	II	40	4206.18	II	29	6471.66	I	25	12816.04	I
5	3136.02	I	50	4220.07	II	32	6493.78	I	24	12823.86	I
6	3140.79	I	50	4226.73	I	28	6499.65	I	25	12909.10	I
7	3150.75	I	15	4240.46	I	23	6572.78	I	30	13033.57	I
170	3158.87	II	24	4283.01	I	30	6717.69	I	21	13086.44	I
180	3179.33	II	22	4289.36	I	33	7148.15	I	24	13134.95	I
5	3180.52	I	22	4298.99	I	31	7202.19	I	20	16150.77	I
150	3181.28	II	25	4302.53	I		7291.47	II	22	16157.36	I
7	3209.96	I	23	4307.74	I		7323.89	II	21	16197.04	I
8	3215.17	I	22	4318.65	I	33	7326.15	I	20	18925.47	I
6	3215.34	I	20	4355.08	I	30	7575.81	II	24	18970.14	I
9	3225.90	I	25	4425.44	I	60	7581.11	II	30	19046.14	I
6	3226.15	I	26	4434.96	I	80	7601.30	II	48	19309.20	I
5	3274.67	I	25	4435.69	I	20	7602.32	II	49	19452.99	I
6	3286.07	I	30	4454.78	I	40	7820.78	II	47	19505.72	I
10	3308.02	II	28	4455.89	I	60	7843.38	II	50	19776.79	I
20	3316.51	II	20	4456.61	I	20	8017.50	II	35	19853.10	I
10	3344.51	I	20	4472.04	II	20	8020.50	II	34	19862.22	I
10	3347.04	II	10	4479.23	II	70	8133.05	II	23	19917.19	I
11	3350.21	I	20	4489.18	II	100	8201.72	II	24	19933.70	I
9	3350.36	I	23	4526.94	I	110	8248.80	II		21389.00	II
12	3361.92	I	22	4578.55	I	70	8254.73	II		21428.90	II
9	3362.14	I	23	4581.40	I	14	8256.67	I	20	22607.93	I
10	3452.66	II	23	4581.47	I	10	8338.04	I	25	22624.93	I
20	3461.87	II	24	4585.87	I	12	8339.12	I	30	22651.23	I
9	3468.48	I	24	4585.96	I	10	8352.39	I			
11	3474.76	I	20	4685.27	I	11	8357.17	I		Ca III	
10	3485.61	II	30	4716.74	II	130	8498.02	II		Refs. 25,26	
13	3487.60	I	40	4721.03	II	170	8542.09	II		– J.J.W. and H.H.S.	
10	3495.16	II	40	4799.97	II	10	8633.95	I		Vacuum	
15	3624.11	I	25	4878.13	I	160	8662.14	II	6	296.96	III
17	3630.75	I	70	5001.48	II	12	8842.61	I	9	403.72	III
14	3630.97	I	80	5019.97	II	15	8909.18	I	7	409.95	III
20	3644.41	I	40	5021.14	II	100	8912.07	II	5	439.69	III
14	3644.77	I	23	5041.62	I	110	8927.36	II	5	633.59	III
8	3644.99	I	25	5188.85	I	12	8967.47	I	5	685.41	III
5	3675.29	I	22	5261.71	I	16	9099.10	I	5	697.55	III
6	3678.21	I	23	5262.24	I	13	9105.62	I	5	699.09	III
30	3683.70	II	22	5264.24	I	12	9108.82	I	5	699.89	III
40	3694.11	II	24	5265.56	I	10	9171.14	I	6	701.39	III
10	3694.36	II	25	5270.27	I	110	9213.90	II	5	727.66	III
170	3706.03	II	60	5285.27	II	90	9312.00	II	8	740.55	III
180	3736.90	II	70	5307.22	II	100	9319.56	II	6	746.25	III
10	3739.38	II	50	5339.19	II	110	9320.65	II	5	747.98	III
6	3748.35	I	27	5349.47	I	25	9416.97	I	5	779.61	III
8	3750.29	I	23	5512.98	I	10	9456.80	I	5	800.30	III
9	3753.34	I	25	5581.97	I	10	9534.88	I	5	809.93	III
20	3755.67	II	27	5588.76	I	11	9548.38	I	5	817.06	III
30	3758.39	II	24	5590.12	I	100	9567.97	II	6	821.57	III
9	3870.48	I	26	5594.47	I	110	9599.24	II	6	840.56	III
11	3872.54	I	25	5598.49	I	80	9601.82	II	6	1020.07	III
11	3872.56	I	24	5601.29	I	10	9604.28	I	5	1034.65	III
12	3875.78	I	24	5602.85	I	12	9663.65	I	5	1187.30	III
12	3875.80	I	30	5857.45	I	10	9664.41	I	8	1188.61	III
6	3889.10	I	10	5922.72	II	14	9676.30	I	8	1188.61	III
6	3923.48	I	10	5923.69	II	14	9688.67	I	5	1190.86	III
230	3933.66	II	27	6102.72	I	13	9701.94	I	10	1262.65	III
9	3935.29	I	29	6122.22	I	80	9854.74	II	11	1278.39	III
6	3946.04	I	22	6161.29	I	110	9890.63	II	10	1281.55	III
15	3948.90	I	30	6162.17	I	90	9931.39	II	12	1286.52	III
17	3957.05	I	22	6163.76	I	100	10223.04	II	12	1298.04	III
220	3968.47	II	24	6166.44	I	20	10343.81	I	11	1317.70	III
8	3972.57	I	26	6169.06	I	13	10838.97	I	10	1328.95	III
18	3973.71	I	28	6169.56	I	13	10861.58	I	11	1335.13	III
50	4097.10	II	35	6439.07	I	13	10863.87	I	10	1360.01	III
15	4098.53	I	30	6449.81	I	14	10869.50	I	11	1385.43	III
15	4098.57	I	22	6455.60	I	14	10879.87	I	11	1397.69	III
60	4109.82	II	80	6456.87	II	20	11838.99	II	13	1453.16	III
30	4110.28	II	34	6462.57	I	10	11949.72	II	12	1459.79	III

Ca III		
Intensity	Wavelength	
11	1461.88	III
15	1463.34	III
16	1484.87	III
12	1496.88	III
11	1506.88	III
20	1545.29	III
15	1555.53	III
18	1562.47	III
13	1571.27	III
13	1586.13	III
10	1762.26	III
10	1783.93	III
10	1794.22	III
12	1800.21	III
13	1807.89	III
14	1812.15	III
11	1813.59	III
12	1830.06	III
10	1860.43	III
14	1870.26	III
14	1872.37	III
10	1894.12	III
11	1910.10	III
12	1935.72	III
10	1939.68	III
11	1943.01	III
12	1948.26	III
10	1953.55	III
10	1958.97	III
13	1964.61	III
13	1967.94	III
12	1972.82	III
10	1977.01	III
10	1978.55	III
11	1981.19	III
	Air	
12	2033.36	III
12	2041.53	III
13	2078.92	III
13	2098.49	III
15	2114.41	III
17	2123.03	III
14	2129.19	III
14	2133.96	III
13	2140.36	III
16	2152.43	III
12	2171.57	III
12	2276.52	III
15	2312.08	III
14	2497.74	III
15	2541.50	III
13	2587.15	III
12	2590.41	III
15	2620.82	III
15	2634.14	III
12	2686.72	III
16	2687.76	III
15	2704.86	III
14	2771.28	III
15	2791.59	III
16	2813.88	III
17	2866.54	III
18	2869.95	III
19	2881.78	III
21	2899.79	III
19	2924.33	III
20	2988.63	III
18	2989.27	III
15	3028.59	III

Ca III		
Intensity	Wavelength	
19	3119.67	III
15	3367.79	III
19	3372.67	III
18	3537.77	III
15	4081.77	III
15	4153.57	III
15	4164.31	III
15	4184.20	III
18	4207.24	III
17	4233.74	III
16	4240.74	III
15	4284.39	III
20	4302.81	III
15	4329.19	III
16	4333.57	III
15	4358.38	III
19	4399.59	III
17	4406.29	III
17	4431.30	III
19	4499.88	III
18	4516.59	III
18	4572.12	III
11	4708.83	III
11	4716.27	III
10	4859.17	III
10	5008.95	III
10	5050.07	III
10	5231.82	III
11	5247.37	III
13	5271.98	III
10	5301.32	III
11	5321.29	III
10	5328.06	III
11	5570.58	III
10	5579.06	III
13	6069.98	III
10	6173.22	III
12	6213.98	III
11	6294.89	III
11	6370.11	III
10	6387.55	III
12	6424.51	III
12	6485.35	III
10	6538.78	III
10	6542.24	III
10	7308.69	III
10	7843.06	III
12	7898.46	III
10 l	8217.20	III

Ca IV		
Ref. 150		
– J.J.W. and H.H.S.		
Vacuum		
150	249.41	IV
150	250.15	IV
150	251.35	IV
250	296.55	IV
200	299.32	IV
200	318.09	IV
50	318.39	IV
120	321.59	IV
250	329.12	IV
150	329.39	IV
200	331.44	IV
250	331.99	IV
235	332.53	IV
150	332.81	IV
200	338.83	IV

Ca IV		
Intensity	Wavelength	
150	339.79	IV
200	340.29	IV
200	341.29	IV
200	341.46	IV
250 c	342.45	IV
100	343.19	IV
200	343.44	IV
250	343.93	IV
200	344.96	IV
215	345.13	IV
250	374.74	IV
600	434.57	IV
100	437.27	IV
250	437.77	IV
200	438.93	IV
750	443.82	IV
50	445.02	IV
500	450.57	IV
50	454.55	IV
250	456.98	IV
250	461.09	IV
150	565.46	IV
750	656.00	IV
500	669.70	IV

Ca V		
Ref. 150		
– J.J.W. and H.H.S.		
200	190.36	V
250	190.46	V
250	196.97	V
300	199.55	V
250	200.51	V
265	257.98	V
165	260.45	V
400	267.77	V
300	270.31	V
200	271.14	V
250	272.27	V
200	272.98	V
400	280.99	V
300	284.98	V
450 c	286.96	V
500	322.17	V
250	322.76	V
300	323.22	V
250	324.48	V
250	325.28	V
300	330.94	V
200	333.44	V
200	333.57	V
300	334.55	V
250 c	335.34	V
200	336.55	V
200	337.54	V
250	338.06	V
200	343.64	V
450	352.92	V
250	356.25	V
250	377.18	V
200	387.08	V
750	425.00	V
500	558.60	V
400	637.93	V
300	643.12	V
400	646.57	V
250	647.88	V
250	651.55	V
300	656.76	V

CALIFORNIUM (Cf)

Z = 98

Cf I and II		
Refs. 52,331 – J.G.C.		
Intensity	Wavelength	
	Air	
10000	2739.31	
10000 s	2759.10	
10000	2774.52	
10000 l	2852.03	
10000 s	2855.24	
10000	3298.14	
10000	3352.71	
10000 l	3367.79	
10000	3392.22	I
10000	3481.07	
10000 l	3513.47	
10000	3531.49	I
10000	3540.98	I
10000	3598.77	I
10000	3605.32	I
10000	3612.11	II
10000	3617.49	I
10000 s	3626.76	II
10000	3659.46	
10000	3662.70	I
10000 s	3699.49	
10000 l	3722.11	II
10000	3739.35	I
10000	3785.61	I
10000 l	3789.04	II
10000 s	3893.23	II
10000 l	3993.57	II
10000	4035.45	
10000	4099.12	I
10000	4242.38	I
10000	4329.03	I
10000	4335.22	I
10000	5173.96	I
10000	5179.08	I
10000	5219.24	I
10000 s	5279.01	
10000 s	5320.09	
10000 s	5339.13	
10000	5408.88	I
10000	5726.05	I
10000	6622.83	I
10000	6631.26	I
10000	6677.90	I
10000	6894.59	I
10000	6927.10	II
10000 l	7074.52	I
10000 s	7307.90	I
10000	8141.29	I
10000	8241.77	I
10000	8333.85	II
10000	8423.49	II
10000	8568.83	II
10000 l	9228.52	
10000	9337.70	
10000	9649.51	
10000 s	10308.41	
10000 l	10568.83	
10000 s	10614.84	
10000	11300.19	
10000	11681.85	
10000	11941.33	

Cf I and II

Intensity	Wavelength
10000 l	12183.05
10000 s	12352.72
10000 s	12437.48
10000 l	12787.41
10000 l	13329.98
10000 s	13362.98
10000 l	13376.89
10000 l	13474.44
10000 l	14772.49
10000 s	15281.32
10000	15587.12
10000	15675.92
10000	16759.06
10000 s	17626.25
10000 l	18718.69
10000 h	19068.71
10000 l	19336.96
10000 l	19576.84
10000 l	20393.38
10000 s	20869.98

CARBON (C)

Z = 6

C I and II

Ref. 211 - R.L.K.

Vacuum

9	595.022	II
30	687.053	II
50	687.345	II
10	858.092	II
20	858.559	II
30	903.624	II
60	903.962	II
150	904.142	II
30	904.480	II
9	1009.86	II
10	1010.08	II
10	1010.37	II
80	1036.337	II
150	1037.018	II
150	1157.910	I
150	1158.019	I
150	1158.035	I
150	1188.992	I
150	1189.447	I
200	1189.631	I
300	1193.009	I
300	1193.031	I
300	1193.240	I
300	1193.264	I
100	1193.393	I
150	1193.649	I
150	1193.679	I
100	1194.064	I
100	1194.488	I
100	1261.552	I
250	1277.245	I
250	1277.282	I
300	1277.513	I
300	1277.550	I
200	1280.333	I
100	1311.363	I
9	1323.951	II
120	1329.578	I
120	1329.600	I
150	1334.532	II
300	1335.708	II

C I and II

Intensity	Wavelength	
100	1354.288	I
150	1355.84	I
120	1364.164	I
100	1459.032	I
200	1463.336	I
120	1467.402	I
150	1481.764	I
150	1560.310	I
400	1560.683	I
400	1560.708	I
100	1561.341	I
400	1561.438	I
150	1656.266	I
120	1656.928	I
300	1657.008	I
120	1657.380	I
120	1657.907	I
150	1658.122	I
500	1751.823	I
1000	1930.905	I
	Air	
800	2478.56	I
250	2509.12	II
350	2512.06	II
250 h	2574.83	II
350 l	2741.28	II
250	2746.49	II
1000	2836.71	II
800	2837.60	II
800 h	2992.62	II
350	3876.19	II
350	3876.41	II
350	3876.66	II
570	3918.98	II
800	3920.69	II
250	4074.52	II
350 l	4075.85	II
800	4267.00	II
1000	4267.26	II
200	4771.75	I
200	4932.05	I
200	5052.17	I
350	5132.94	II
350	5133.28	II
350	5143.49	II
570	5145.16	II
400	5151.09	II
300	5380.34	I
250	5648.07	II
350	5662.47	II
570	5889.77	II
350	5891.59	II
200	6001.13	I
250	6006.03	I
110	6007.18	I
150	6010.68	I
300	6013.22	I
250	6014.84	I
800	6578.05	II
570	6582.88	II
200	6587.61	I
250	6783.90	II
250	7113.18	I
250	7115.19	I
250	7115.63	II
200	7116.99	I
350	7119.90	II
800	7231.32	II
1000	7236.42	II

C I and II

Intensity	Wavelength	
200	7860.89	I
200	8058.62	I
520	8335.15	I
250	9061.43	I
200	9062.47	I
200	9078.28	I
250	9088.51	I
450	9094.83	I
300	9111.80	I
800	9405.73	I
150	9603.03	I
250	9620.80	I
300	9658.44	I
200	10683.08	I
300	10691.25	I
12	11619.29	I
23	11628.83	I
13	11658.85	I
47	11659.68	I
24	11669.63	I
85	11748.22	I
142	11753.32	I
114	11754.76	I
11	11777.54	I
17	11892.91	I
30	11895.75	I
26	12614.10	I
20	13502.27	I
38	14399.65	I
16	14403.25	I
61	14420.12	I
12	14429.03	I
13	14442.24	I
12	16559.66	I
50	16890.38	I
10	17338.56	I
11	17448.60	I
13	18139.80	I
23	19721.99	I

C III

Refs. 22,211 - R.L.K.

Vacuum

250	371.69	III
250	371.75	III
150	371.78	III
500	386.203	III
200	450.734	III
400	459.46	III
500	459.52	III
570	459.63	III
250	511.522	III
250	535.288	III
300	538.080	III
350	538.149	III
400	538.312	III
350	574.281	III
800	977.03	III
370	1174.93	III
350	1175.26	III
330	1175.59	III
500	1175.71	III
350	1175.99	III
370	1176.37	III
	Air	
250	2162.94	III
800	2296.87	III
150	2697.75	III
110 l	2724.85	III

C III

Intensity	Wavelength	
150 l	2725.30	III
150 l	2725.90	III
200	2982.11	III
150	4056.06	III
200	4067.94	III
250	4068.91	III
250	4070.26	III
150	4162.86	III
250 h	4186.90	III
200	4325.56	III
600	4647.42	III
520	4650.25	III
375	4651.47	III
200	4665.86	III
450	5695.92	III
150	5826.42	III
150	6744.38	III
150 h	7037.25	III
150	7612.65	III
300 h	8196.48	III
150	8332.99	III
300	8500.32	III

C IV

Refs. 66,211 - R.L.K.

Vacuum

250	244.91	IV
200	289.14	IV
250	289.23	IV
570	312.42	IV
500	312.46	IV
650	384.03	IV
700	384.18	IV
400	419.52	IV
500	419.71	IV
1000	1548.202	IV
900	1550.774	IV
	Air	
200 l	2524.41	IV
300 s	2529.98	IV
200 w	4658.30	IV
250	5801.33	IV
200	5811.98	IV
90 w	7726.2	IV

C V

Ref. 211 - R.L.K.

Vacuum

110	34.973	V
450	40.268	V
110	227.19	V
160	248.66	V
160	248.74	V
	Air	
40	2270.91	V
5	2277.25	V
20	2277.92	V
5	4943.88	V
5	4944.56	V

CERIUM (Ce)

Z = 58

Ce I and II

Ref. 1 - C.H.C.

Air

130	2462.97	II
110	2518.51	II
200	2548.68	II

Ce I and II			Ce I and II			Ce I and II			Ce I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
340	2651.01	II	330	3274.86	II	220	3704.98	II	270	3909.31	II
120	2696.07	II	200	3279.84	II	1000	3709.29	II	230	3912.19	II
120	2706.88	II	330	3285.22	II	1000	3709.93	II	980	3912.44	II
120	2723.38	II	240	3295.28	II	1400	3716.37	II	390	3915.52	II
110	2741.96	II	200	3296.88	II	420	3718.19	II	390	3916.14	II
100	2750.89	II	220	3300.15	II	420	3718.38	II	230	3917.64	II
150	2761.42	II	240	3304.84	II	210	3719.80	II	770	3918.28	II
120	2784.27	II	200	3312.22	II	420	3725.68	II	480	3919.81	II
100	2785.35	II	240	3314.72	II	490	3728.02	II	590	3921.73	II
100	2790.53	II	200	3317.80	II	800	3728.42	II	560	3923.11	II
140	2791.42	II	200	3334.46	II	320	3748.06	II	450	3924.64	II
270	2830.90	II	240	3341.87	II	250	3751.45	II	770	3931.09	II
100	2833.31	II	330	3343.86	II	200	3755.43	II	310	3931.37	II
250	2874.14	II	440	3344.76	II	300	3762.98	II	230	3931.83	II
110	2908.42	II	200	3355.02	II	680	3764.12	II	310	3933.73	II
100	2918.67	II	240	3357.22	II	200	3765.04	II	560	3938.09	II
120	2955.94	II	200	3360.54	II	300	3768.76	II	770	3940.34	II
110	2964.80	II	240	3366.55	II	210	3770.76	II	310	3940.97	II
100	2972.58	II	200	3371.18	II	300	3771.60	II	2000	3942.15	II
400	2976.91	II	200	3373.46	II	250	3776.61	II	2700	3942.75	II
150	2977.46	II	200	3373.73	II	620	3781.62	II	770	3943.89	II
120	2980.41	II	480	3377.13	II	440	3782.52	II	310	3947.97	II
250	2990.87	II	200	3383.68	II	200	3783.58	II	3100	3952.54	II
110	2994.42	II	200	3404.91	II	860	3786.63	II	340	3953.66	II
320	2995.64	II	240	3405.98	II	520	3788.75	II	310	3955.36	II
400	3008.79	II	290	3417.45	II	300	3792.32	II	230	3956.06	II
370	3017.20	II	600	3422.71	II	2500	3801.52	II	980	3956.28	II
210	3037.73	II	390	3426.21	II	800	3803.09	II	230	3958.27	II
200	3051.98	II	290	3441.21	II	1000	3808.11	II	230	3958.87	II
350	3055.24	II	480	3476.84	II	490	3809.21	II	770	3960.91	II
320	3056.78	II	240	3482.35	II	250	3812.20	II	390	3964.50	II
680	3063.01	II	710	3485.05	II	490	3815.85	II	770	3967.05	II
320	3083.67	II	210	3507.94	II	470	3817.46	II	450	3971.68	II
250	3084.44	II	600	3517.38	II	300	3819.02	II	270	3972.07	II
200	3090.37	II	210	3520.52	II	470	3823.90	II	270	3975.07	II
370	3103.38	II	330	3521.88	II	470	3830.55	II	770	3978.65	II
200	3107.47	II	210	3526.68	II	490	3831.08	II	560	3980.88	II
320	3110.28	II	600	3534.05	II	490	3834.55	II	560	3982.89	II
300	3111.17	II	770	3539.08	II	270	3836.10	II	310	3983.29	II
220	3127.53	II	210	3545.60	II	1100	3838.54	II	770	3984.68	II
200	3130.33	II	290	3546.19	II	200	3843.76	II	370	3989.44	II
240	3130.87	II	240	3552.73	II	220	3846.52	II	700	3992.39	II
200	3144.60	II	420	3555.00	II	250	3848.10	II	370	3992.91	II
290	3145.28	II	1200	3560.80	II	860	3848.59	II	910	3993.82	II
290	3146.41	II	210	3576.23	II	860	3853.15	II	2800	3999.24	II
290	3164.15	II	1000	3577.45	II	1200	3854.18	II	230	4001.56	II
290	3169.18	II	330	3590.60	II	1200	3854.31	II	910	4003.77	II
290	3171.61	II	390	3607.63	II	620	3855.29	II	370	4005.64	II
480	3183.52	II	550	3609.69	II	390	3857.02	II	210	4007.59	II
240	3186.13	II	420	3613.70	II	370	3857.64	II	2700	4012.39	II
200	3190.34	II	440	3622.15	II	200	3862.46	II	910	4014.90	II
710	3194.83	II	380	3623.74	II	200	3868.13	II	250	4015.88	II
200	3199.28	II	440	3623.84	II	270	3874.68	II	200	4019.04	II
990	3201.71	II	200	3631.19	II	620	3876.97	II	240	4022.27	II
200	3218.38	II	350	3646.97	II	1100	3878.36	II	840	4024.49	II
710	3218.94	II	260	3647.75	II	1500	3882.45	II	240	4025.15	II
880	3221.17	II	260	3647.95	II	1000	3889.98	II	840	4028.41	II
330	3225.67	II	420	3653.11	II	210	3890.75	II	250	4030.34	II
710	3227.11	II	660	3653.67	II	210	3890.98	II	840	4031.34	II
240	3229.36	II	310	3654.97	II	620	3895.11	II	340	4037.67	II
480	3231.24	II	1800	3655.85	II	590	3896.80	II	2100	4040.76	II
710	3234.16	II	440	3659.23	II	490	3898.27	II	910	4042.58	II
330	3234.89	II	350	3659.97	II	270	3898.94	II	230	4045.21	II
390	3236.74	II	880	3660.64	II	200	3903.34	II	620	4046.34	II
390	3243.37	II	880	3667.98	II	250	3904.34	II	210	4051.43	II
200	3246.67	II	220	3672.18	I	200	3906.92	II	210	4051.99	II
200	3260.98	II	350	3672.79	II	770	3907.29	II	700	4053.51	II
200	3263.88	II	220	3679.42	II	560	3908.41	II	450	4054.99	II
990	3272.25	II	300	3694.91	II	390	3908.54	II	280	4062.22	II

Ce I and II			Ce I and II			Ce I and II			Ce I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
230	4062.94	II	530	4187.32	II	450	4444.70	II	110	5147.57	II
280	4067.28	II	560	4193.09	II	770	4449.34	II	100	5149.99	I
420	4068.84	II	370	4193.28	II	620	4450.73	II	280	5159.69	I
1100	4071.81	II	370	4193.87	II	2400	4460.21	II	280	5161.48	I
270	4072.92	II	630	4196.34	II	450	4461.14	II	190	5174.55	I
1800	4073.48	II	280	4198.00	II	420	4463.41	II	370	5187.46	II
210	4073.74	II	280	4198.67	II	280	4467.54	II	210	5191.66	II
1500	4075.71	II	840	4198.72	II	1400	4471.24	II	190	5211.92	I
1500	4075.85	II	240	4201.24	II	450	4472.72	II	260	5223.46	I
210	4076.24	II	910	4202.94	II	700	4479.36	II	180	5229.75	I
420	4077.47	II	270	4209.41	II	700	4483.90	II	140	5232.92	II
530	4078.32	II	370	4214.04	II	840	4486.91	II	260	5245.92	I
270	4078.52	II	310	4217.59	II	250	4497.85	II	130	5265.71	II
270	4080.44	II	1500	4222.60	II	100	4506.41	I	340	5274.23	II
670	4081.22	II	770	4227.75	II	110	4515.86	II	130	5296.56	I
910	4083.23	II	390	4231.74	II	100	4519.59	II	130	5328.08	I
450	4085.23	II	240	4234.21	II	770	4523.08	II	190	5330.54	II
250	4087.36	II	200	4236.02	II	840	4527.35	II	450	5353.53	II
230	4088.85	II	980	4239.92	II	840	4528.47	II	300	5393.40	II
450	4101.77	II	390	4242.72	II	110	4532.49	II	150	5397.64	I
250	4105.00	II	310	4245.89	II	110	4539.07	II	280	5409.23	II
510	4107.42	II	310	4245.98	II	840	4539.75	II	110	5420.38	I
200	4110.38	II	390	4246.72	II	210	4544.96	II	140	5449.24	I
250	4111.39	II	1100	4248.68	II	250	4551.30	II	140	5468.37	II
420	4115.37	II	390	4253.37	II	650	4560.28	II	140	5472.29	II
250	4117.01	II	620	4255.79	II	310	4560.96	II	260	5512.08	II
200	4117.29	II	200	4263.43	II	2100	4562.36	II	110	5556.25	I
200	4117.59	II	620	4270.19	II	420	4565.84	II	170	5564.97	I
770	4118.14	II	390	4270.72	II	1100	4572.28	II	130	5565.97	I
250	4119.02	II	200	4278.86	II	420	4582.50	II	100	5595.88	I
310	4119.79	II	280	4285.37	II	130	4591.12	II	240	5601.28	I
310	4119.88	II	200	4288.66	II	840	4593.93	II	190	5655.14	I
450	4120.83	II	200	4289.44	II	420	4606.40	II	240	5669.96	I
510	4123.24	II	2000	4289.94	II	420	4624.90	II	120	5677.75	I
510	4123.49	II	200	4296.07	II	1700	4628.16	II	120	5692.94	I
980	4123.87	II	1500	4296.67	II	170	4632.32	I	300	5696.99	I
510	4124.79	II	420	4296.78	II	110	4650.51	I	370	5699.23	I
980	4127.37	II	590	4299.36	II	130	4654.29	II	240	5719.03	I
250	4127.74	II	770	4300.33	II	110	4669.50	II	140	5773.12	I
200	4128.07	II	420	4305.14	II	150	4680.13	II	120	5788.15	I
530	4130.71	II	770	4306.72	II	270	4684.61	II	120	5812.92	I
480	4131.10	II	390	4309.74	II	200	4714.00	II	230	5940.86	I
2700	4133.80	II	560	4320.72	II	100	4714.81	II	11	6000.18	I
270	4135.44	II	310	4330.45	II	110	4725.09	II	55	6001.90	I
270	4137.47	II	310	4332.71	II	100	4733.52	II	55	6005.86	I
2000	4137.65	II	240	4336.23	II	310	4737.28	II	15	6006.20	I
270	4138.10	II	980	4337.77	II	100	4739.53	II	55	6006.82	I
210	4138.35	II	340	4339.31	II	160	4747.17	II	19	6007.37	I
770	4142.40	II	700	4349.79	II	110	4757.84	II	75	6013.42	I
390	4144.49	II	560	4352.71	II	100	4768.77	II	23	6016.59	I
670	4145.00	II	910	4364.66	II	230	4773.94	II	110	6024.20	I
480	4146.23	II	350	4373.82	II	110	4822.55	I	15	6027.16	I
280	4148.90	II	530	4375.92	II	140	4847.77	I	11	6031.26	I
420	4149.79	II	910	4382.17	II	180	4882.46	II	23	6033.58	II
980	4149.94	II	700	4386.84	II	110	4943.44	I	35	6034.20	II
420	4150.91	II	310	4388.01	II	130	4971.50	II	23	6034.41	I
1400	4151.97	II	1700	4391.66	II	130	4994.63	I	35	6035.49	II
230	4153.13	II	200	4398.79	II	210	5009.10	I	110	6043.39	II
450	4159.03	II	510	4399.20	II	100	5011.77	II	28	6045.42	I
310	4163.52	II	350	4410.64	II	120	5022.87	II	55	6047.40	I
1300	4165.61	II	350	4410.76	II	120	5037.78	II	19	6051.80	II
620	4166.88	II	310	4416.90	II	120	5040.85	I	23	6057.50	I
250	4167.80	II	980	4418.78	II	180	5044.02	II	35	6058.00	I
320	4169.77	II	200	4423.68	II	120	5071.78	I	23	6066.75	I
320	4169.88	II	310	4427.07	II	240	5075.35	II	19	6069.46	I
340	4176.70	II	480	4427.92	II	470	5079.68	II	35	6069.48	I
340	4181.08	II	310	4428.44	II	130	5112.70	I	35	6072.00	I
340	4185.33	II	650	4429.27	II	160	5117.17	II	35	6076.61	I
3500	4186.60	II	480	4444.39	II	170	5129.57	I	17	6077.16	I

Ce I and II			Ce I and II			Ce I and II			Ce III		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
17	6080.37	I	19	6517.31	I	25	7329.91	I	400	860.15	III
17	6081.28	I	19	6551.70	I	16	7334.68	II	200	862.25	III
19	6088.86	I	45	6555.65	I	12	7343.44	I	40	868.74	III
19	6088.96	I	23	6579.10	I	25	7397.77	I	20	869.51	III
35	6093.19	I	15	6606.35	I	11	7401.27	I	40	869.84	III
45	6098.34	II	15	6606.86	II	12	7417.94	II	20	871.15	III
11	6099.80	I	22	6612.06	I	11	7424.70	CeO	40	871.27	III
28	6108.74	II	10	6623.00	I	12	7433.08	I	20	880.68	III
15	6118.56	I	30	6628.93	I	11	7438.56	I	60	881.75	III
17	6118.90	I	13	6650.89	I	12	7444.44	I	60	884.04	III
45	6123.67	I	22	6652.72	II	10	7472.41	I	20	885.22	III
19	6132.00	II	10	6661.41	I	16	7486.57	II	30	888.39	III
19	6132.18	I	13	6665.59	I	11	7527.46	I	80	892.75	III
11	6135.45	I	10	6675.54	II	11	7527.68	I	20	899.32	III
23	6139.03	I	15	6686.60	I	10	7533.73	I	100	912.77	III
15	6142.92	I	26	6700.66	I	10	7551.25	I	40	937.04	III
35	6143.36	II	35	6704.27	I	12	7562.44	I	40	999.26	III
23	6146.43	I	13	6704.52	II	10	7562.86	I	20	1025.25	III
19	6147.84	I	10	6706.04	II	10 h	7563.60	I	20	1025.29	III
23	6151.72	I	15	6728.71	I	10	7603.10	I	20	1026.28	III
19	6159.82	I	15	6729.57	I	25	7616.11	II	40	1029.37	III
19	6162.14	I	15	6744.70	II	12	7646.08	I	20	1034.55	III
19	6165.45	I	10	6746.90	I	10	7647.88	I	20	1041.14	III
19	6175.28	I	30	6774.28	II	12	7682.47	I	100	1042.74	III
35	6186.17	I	35	6775.59	I	25	7689.17	II	50	1051.61	III
15	6187.97	I	10	6778.28	I	10	7732.33	I	70	1057.40	III
15	6195.23	I	18	6807.81	I	16	7748.35	I	100	1057.66	III
19	6195.53	I	10	6808.82	I	10	7797.70	I	100	1058.46	III
19	6198.05	I	15	6818.23	I	12	7842.59	I	50	1062.99	III
35	6208.98	I	10	6829.73	II	22	7844.94	II	30	1063.26	III
11	6216.82	I	13	6847.25	I	16	7850.02	II	50	1063.51	III
35	6228.94	I	12	6856.55	I	16	7851.18	II	100	1067.76	III
19	6229.13	I	10	6893.66	I	22	7857.54	II	100	1068.69	III
23	6232.45	II	10	6898.45	II	12	7864.49	I	20	1070.54	III
28	6237.45	I	30	6924.81	I	10	7866.04	I	200	1072.79	III
13	6238.71	I	10	6939.45	I	16	7898.96	II	40	1073.69	III
11	6241.87	I	19	6973.50	II	11	7913.52	I	30	1079.35	III
13	6242.91	I	10	6983.82	II	10	7927.30	CeO	20	1080.82	III
15	6253.65	I	30	6986.02	I	10	7927.72	I	30	1088.70	III
13	6257.99	I	12	7054.51	I	10	7934.50	II	30	1090.03	III
15	6264.27	I	11	7058.68	II	30	8025.56	II	20	1092.48	III
45	6272.05	II	11	7060.00	I	16	8070.71	I	20	1099.25	III
15	6276.47	I	35	7061.75	II	10	8094.43	I	40	1100.71	III
35	6295.58	I	11	7064.49	I	16	8120.36	I	20	1107.09	III
28	6299.51	II	35	7086.35	II	10	8241.55	II	20	1111.19	III
23	6300.21	I	11	7105.04	II	12	8261.09	I	20	1116.30	III
13	6306.64	I	11	7115.08	II	16	8418.23	II	20	1125.58	III
35	6310.01	I	10	7124.73	I	11	8495.82	I	20	1129.73	III
15	6335.40	I	16	7141.42	I	12	8539.08	II	20	1132.74	III
11	6337.21	I	19	7150.23	II	10	8612.64	I	100	1142.55	III
13	6340.70	I	10	7151.67	I	10 h	8647.66	I	20	1192.41	III
35	6343.95	II	16	7155.25	I	11 h	8702.38	II	50	1201.87	III
35	6371.11	II	16	7156.99	II	25	8772.14	II	20	1204.05	III
28	6386.84	I	16	7189.40	II	12	8810.84	I	20	1719.43	III
23	6393.02	II	10	7191.72	I	30	8891.20	II	20	1796.89	III
11	6395.16	I	11	7201.56	II				20	1836.66	III
11	6425.29	II	16	7201.89	I		Ce III		20	1836.99	III
35	6430.07	I	10	7203.55	I		Refs. 136,305 – J.R.		30	1862.32	III
19	6434.39	I	12	7210.67	I		Vacuum		30	1950.36	III
23	6436.40	I	19	7217.36	I	100	840.24	III	20	1990.54	III
19	6446.12	I	16	7235.71	II	20	844.11	III		Air	
35	6458.03	I	22	7238.36	II	40	845.02	III	100	2033.34	III
19	6466.88	II	12	7241.73	I	20	847.88	III	100	2057.65	III
28	6467.39	I	25	7252.75	I	200	851.18	III	100	2077.87	III
35	6473.72	I	12	7262.64	I	200	852.63	III	200	2083.32	III
17	6490.97	I	11 h	7277.90	I	200	853.47	III	100	2089.96	III
11	6503.27	II	11	7296.17	I	60	853.78	III	400	2109.07	III
11	6507.16	II	19	7301.42	II	200	855.16	III	100	2122.55	III
23	6513.59	II	19	7313.45	II	200	858.30	III	500	2136.95	III

Ce III		
Intensity	Wavelength	
1000	2151.44	III
3000	2166.88	III
2000	2169.48	III
5000	2180.64	III
1000	2183.71	III
2000	2203.15	III
3000	2218.11	III
5000	2222.01	III
5000	2225.08	III
3000	2227.84	III
3000	2228.05	III
5000	2242.29	III
2000	2249.25	III
2000	2264.85	III
2000	2268.20	III
2000	2287.82	III
2000	2298.70	III
3000	2300.65	III
4000	2302.09	III
5000	2317.34	III
10000	2318.64	III
5000	2324.31	III
2000	2337.66	III
5000	2350.10	III
2000	2362.54	III
2000	2367.77	III
10000	2372.34	III
5000	2377.07	III
5000	2377.48	III
10000	2380.12	III
3000	2382.28	III
3000	2385.06	III
5000	2395.04	III
3000	2406.15	III
4000	2408.08	III
2000	2410.26	III
5000	2415.60	III
2000	2417.01	III
2000	2423.02	III
3000	2428.64	III
5000	2430.24	III
10000	2431.45	III
15000	2439.80	III
3000	2441.55	III
2000	2444.78	III
10000	2454.32	III
10000	2469.95	III
3000	2471.66	III
5000	2477.25	III
8000	2479.44	III
3000	2479.51	III
10000	2483.82	III
10000	2497.50	III
3000	2503.56	III
2000	2504.43	III
20000	2531.99	III
3000	2539.27	III
3000	2557.49	III
4000	2577.67	III
2000	2578.30	III
2000	2584.71	III
10000	2603.59	III
2000	2607.96	III
2000	2615.79	III
2000	2649.38	III
2000	2662.81	III
3000	2719.30	III
2000	2730.04	III
3000	2743.71	III

Ce III		
Intensity	Wavelength	
4000	2748.90	III
4000	2754.87	III
4000	2768.28	III
3000	2849.40	III
2000	2861.39	III
4000	2907.05	III
10000	2923.81	III
5000	2925.26	III
10000	2931.54	III
2000	2948.53	III
5000	2973.72	III
10000	3022.75	III
50000	3031.58	III
95000	3055.59	III
20000	3056.56	III
40000	3057.23	III
20000	3057.58	III
40000	3085.10	III
20000	3106.98	III
30000	3110.53	III
30000	3121.56	III
20000	3141.29	III
20000	3143.96	III
20000	3147.06	III
20000	3228.57	III
3000	3234.20	III
4000	3267.76	III
3000	3267.94	III
20000	3353.29	III
10000	3395.77	III
4000	3398.91	III
30000	3427.36	III
40000	3443.63	III
30000	3454.39	III
40000	3459.39	III
60000	3470.92	III
50000	3497.81	III
60000	3504.64	III
500	3514.41	III
50000	3544.07	III
3000	3784.29	III
800	3936.80	III
300	3957.10	III
500	4169.42	III
300	4191.70	III
500	4194.83	III
300	4213.26	III
300	4217.13	III
400	4284.77	III
300	4304.71	III
600	4346.35	III
400	4389.97	III
600	4448.32	III
500	4485.27	III
1000	4521.92	III
1000	4535.73	III
300	4576.90	III
500	4627.60	III
300	4766.07	III
500	4976.45	III
500	5650.97	III
1000	5664.20	III
500	5691.08	III
300	5710.59	III
500	5749.47	III
500	5949.83	III
2000	5962.22	III
500	5962.71	III
400	5979.56	III

Ce III		
Intensity	Wavelength	
1000	5983.40	III
3000	6002.63	III
10000	6032.54	III
10000	6060.91	III
500	6061.79	III
500	6097.35	III
500	6098.87	III
500	6135.10	III
300	6287.79	III
500	6308.16	III
300	6341.75	III
1000	6944.94	III
700	7739.04	III
300	7758.27	III
500	7826.80	III
300	7948.64	III
500	7960.31	III
500	7991.01	III
400	8030.80	III
300	8084.12	III
400	8177.33	III
300	8186.03	III
300	8222.16	III
300	9056.53	III
300	9079.58	III
400	9328.20	III
300	9367.03	III
300	9567.37	III
400	10458.37	III
400	10494.42	III
300	10534.36	III
400	10684.46	III
15	12756.96	III
12	12821.62	III
80	15847.58	III
80	15956.79	III
12	15960.59	III
87	16128.75	III
42	18579.82	III
38	19141.29	III
27	19377.15	III
26	19466.14	III
20	19498.14	III
55	19524.18	III
30	20685.63	III
12	21380.23	III

Ce IV		
Ref. 166 - J.R.		
Vacuum		
2	447.58	IV
1	443.11	IV
8	558.92	IV
8	571.59	IV
40	741.79	IV
30	754.60	IV
12	755.75	IV
6	975.20	IV
5	1009.31	IV
2	1022.12	IV
9	1057.67	IV
1	1059.64	IV
50	1289.41	IV
75	1332.16	IV
75	1372.72	IV
2	1577.60	IV
1	1572.62	IV
15	1641.58	IV
20	1775.30	IV

Ce IV		
Intensity	Wavelength	
20	1779.03	IV
35	1914.75	IV
10	1937.21	IV
Air		
100	2000.42	IV
35	2003.11	IV
100	2009.94	IV
3	2433.50	IV
5	2445.50	IV

Ce V		
Ref. 261 - J.R.		
Vacuum		
100	365.66	V
300	399.36	V
150	404.21	V
200	482.96	V
100	552.13	V

CESIUM (Cs)

Z = 55

Cs I and II
Refs. 82,130,154,155,200, 201,223,263,266,267,300, 325,326, - K.L.A.

Vacuum		
25	591.044	II
5	607.291	II
4	612.786	II
200	639.356	II
10	657.112	II
50	668.386	II
1500	718.138	II
1500	808.761	II
1500	813.837	II
3500	901.270	II
4000	926.657	II
130	1178.65	II
80	1191.55	II
Air		
25	2025.05	II
60	2035.15	II
80	2077.43	II
80	2080.05	II
80	2088.71	II
80	2091.97	II
15	2099.50	II
25	2112.65	II
100	2146.75	II
130	2179.60	II
25	2182.14	II
130	2189.47	II
25	2213.15	II
100	2220.51	II
130	2228.88	II
250	2254.58	II
200	2257.82	II
25	2258.35	II
350	2267.61	II
350	2273.83	II
25	2286.68	II
25	2307.71	II
40	2315.68	II
130	2321.07	II
80	2343.13	II
130	2354.44	II
25	2357.85	II
130	2364.81	II

Cs I and II		
Intensity	Wavelength	
250	2392.86	II
80	2414.89	II
25	2432.71	II
25	2443.24	II
130	2476.07	II
40	2480.41	II
130	2515.72	II
15	2523.66	II
130	2539.08	II
25	2539.17	II
60	2550.65	II
130	2551.17	II
130	2568.17	II
250	2568.69	II
1000	2573.03	II
130	2574.54	II
130	2576.74	II
130	2590.09	II
250	2609.44	II
130	2616.27	II
25	2627.95	II
80	2637.14	II
25	2644.69	II
130	2648.07	II
200	2651.71	II
25	2660.24	II
130	2669.79	II
15	2671.17	II
40	2673.24	II
130	2686.60	II
25	2689.41	II
15	2701.19	II
130	2724.21	II
25	2730.07	II
25	2733.88	II
250	2748.23	II
80	2749.84	II
60	2757.81	II
80	2761.97	II
25	2766.10	II
250	2776.99	II
130	2788.24	II
130	2789.80	II
25	2793.32	II
130	2794.50	II
130	2799.41	II
500	2816.94	II
25	2820.27	II
25	2829.04	II
25	2829.42	II
130	2846.19	II
80	2852.42	II
80	2866.37	II
250	2881.19	II
25	2883.74	II
80	2899.75	II
80	2914.65	II
500	2931.09	II
500	2940.95	II
80	2942.25	II
30	2949.80	II
20	2968.38	II
25	2970.85	II
100	3001.27	II
80	3012.04	II
15	3020.37	II
15	3060.98	II
100	3066.60	II
25	3080.87	II

Cs I and II		
Intensity	Wavelength	
100	3092.31	II
80	3180.94	II
800	3265.92	II
800	3267.13	II
500	3271.63	II
100	3329.43	II
800	3368.56	II
100	3559.80	II
100	3565.11	II
15	3651.07	II
15	3680.10	II
15	3687.64	II
100	3699.48	II
15	3732.54	II
100	3734.34	II
15	3751.40	II
350	3785.42	II
500	3805.10	II
15	3870.16	II
150 c	3876.143	I
80 c	3888.608	I
1000	3896.98	II
350	3906.93	II
500	3925.58	II
350	3959.50	II
500	3965.19	II
150	3978.00	II
350	4047.18	II
200	4053.96	II
500	4067.96	II
500	4068.77	II
70	4073.36	II
60	4119.29	II
500	4121.21	II
100	4132.00	II
350	4151.27	II
350	4158.61	II
60	4193.20	II
500	4213.13	II
200	4221.12	II
500	4232.19	II
350	4234.41	II
100	4241.97	II
100	4271.74	II
2000	4277.10	II
1000	4288.35	II
200	4292.00	II
500	4300.64	II
50	4307.94	II
50	4327.58	II
350	4330.24	II
2000	4363.28	II
500	4373.02	II
400	4384.43	II
100	4388.76	II
200	4396.91	II
350	4399.50	II
350	4403.85	II
1000	4405.25	II
350	4410.21	II
100	4424.05	II
350	4435.71	II
100	4444.00	II
200	4453.44	II
200	4457.68	II
200	4459.18	II
100	4493.66	II
1000	4501.52	II
200	4506.71	II

Cs I and II		
Intensity	Wavelength	
100	4506.83	II
100	4515.50	II
150	4522.85	II
1000	4526.72	II
800	4538.94	II
400 c	4555.276	I
150	4566.98	II
150	4571.79	II
200 c	4593.169	I
2500	4603.76	II
100	4609.99	II
150	4616.13	II
350	4623.09	II
500	4646.51	II
150	4656.54	II
350	4670.28	II
100	4695.61	II
500	4701.79	II
350	4732.98	II
350	4739.66	II
100	4749.13	II
500	4763.62	II
200	4786.36	II
800	4830.16	II
800	4870.02	II
800	4952.84	II
500	4972.59	II
800	5043.80	II
500	5052.70	II
500	5059.87	II
100	5081.77	II
400	5096.60	II
1500	5227.00	II
800	5249.37	II
400	5274.04	II
350	5306.61	II
350	5349.16	II
800	5370.97	II
500	5419.69	II
5 c	5465.944	I
5	5502.884	I
1000	5563.02	II
11	5635.212	I
30 c	5664.018	I
8	5745.724	I
350	5814.18	II
500	5831.16	II
5 c	5838.835	I
30	5845.141	I
500	5925.65	II
80 c	6010.490	I
30	6034.089	I
400	6128.62	II
120	6213.100	I
15	6217.599	I
50 c	6354.555	I
100	6419.54	II
15	6431.969	I
15	6472.623	I
200	6495.53	II
200	6536.44	II
30	6586.02	I
200	6586.510	I
35	6628.660	I
200 c	6723.284	I
100	6824.652	I
c	6848.91	I
100	6870.455	I
c	6895.01	I

Cs I and II		
Intensity	Wavelength	
400	6955.52	II
200	6973.297	I
35	6983.491	I
200	7228.536	I
60	7279.90	I
200	7279.957	I
150 c	7608.903	I
300	7943.882	I
60 s	7990.68	I
100	8015.724	I
60 s	8053.35	I
60	8078.92	I
350	8079.033	I
1000 c	8521.122	I
200 c	8761.415	I
600 c	8943.46	I
350	9172.322	I
100	9208.538	I
350	10024.359	I
100	10123.414	I
400	10123.602	I
140	13588.31	I
15	13602.57	I
15	13758.83	I
350	14694.93	I
12	17923.62	I
9	17924.21	I
25	19162.53	I
20	19163.20	I
50	21311.46	I
45	21312.29	I
100	25763.49	I
90	25764.70	I
200	39421.22	I
180	39424.08	I

Cs III Ref. 78 – J.R. Vacuum		
75	556.91	III
250	584.15	III
50	584.40	III
1200	603.01	III
600	607.85	III
800	607.94	III
10000	614.01	III
1500	621.15	III
600	635.86	III
300	637.67	III
2000	638.17	III
25	657.94	III
450	663.82	III
450	664.60	III
2500	666.25	III
1800	673.06	III
400	679.60	III
800	687.55	III
5000	691.60	III
800	699.43	III
3500	703.89	III
1000	710.25	III
20000	721.79	III
20000	722.20	III
5000	731.56	III
300	731.95	III
1000 p	736.66	III
12000	740.29	III
150	742.23	III
1000	749.94	III

Cs III

Intensity	Wavelength	
1500	750.38	III
1500	755.18	III
1200	758.82	III
6	759.90	III
300	787.73	III
75	801.95	III
200	814.02	III
15	817.35	III
800	820.34	III
200	825.99	III
7500	830.39	III
100	837.39	III
4	843.37	III
250	847.92	III
15000	920.35	III
500	921.66	III
25	932.67	III
25000 c	1054.79	III

Cs IV

Ref. 259 – J.R.

Vacuum

150	703.40	IV
7	773.61	IV
4	823.64	IV
150	824.80	IV
15	861.83	IV
200	874.84	IV
150	896.92	IV
100	923.02	IV
200	986.14	IV
50 p	995.14	IV
150	1068.91	IV

CHLORINE (Cl)

Z = 17

Cl I and II

Refs. 238,239 – L.J.R.

Vacuum

350	559.305	II
400	571.904	II
800	574.406	II
500	586.24	II
700	618.057	II
600	619.982	II
800	620.298	II
700	626.735	II
800	635.881	II
1000	636.626	II
1000	650.894	II
1000	659.811	II
1300	661.841	II
2000	663.074	II
1500	682.053	II
1500	687.656	II
1500	693.594	II
2000	725.271	II
2500	728.951	II
2000	777.562	II
5000	787.580	II
5000	788.740	II
5000	793.342	II
6000	839.297	II
8000	839.599	II
7000 p	841.41	II
5000	851.691	II
2000	888.026	II
2000	893.549	II

Cl I and II

Intensity	Wavelength	
2000	961.499	II
30	969.92	I
40	978.284	I
25	998.372	I
25	998.432	I
75	1002.346	I
150	1013.664	I
90	1025.553	I
6000	1063.831	II
3000	1067.945	II
9000	1071.036	II
6000	1071.767	II
5000	1075.230	II
5000	1079.080	II
200	1084.667	I
200	1085.171	I
250	1085.304	I
400	1088.06	I
350	1090.271	I
250	1090.982	I
250	1092.437	I
400	1094.769	I
350	1095.148	I
350	1095.662	I
400	1095.797	I
250	1096.810	I
300	1097.369	I
200	1098.068	I
200	1099.523	I
500	1107.528	I
800	1139.214	II
800	1167.148	I
3000	1179.293	I
1200	1188.774	I
900	1201.353	I
3000	1335.726	I
10000	1347.240	I
5000	1351.657	I
12000	1363.447	I
2500	1373.116	I
20000	1379.528	I
25000	1389.693	I
20000	1389.957	I
12000	1396.527	I
500	1441.470	II
500	1528.569	II
500	1542.942	II
500	1558.144	II
500	1565.050	II
500	1857.488	II
450 h	1997.370	II

Air

450	2032.116	II
350 h	2088.583	II
350 h	2091.458	II
170	2427.79	II
360	2434.07	II
340	2498.53	II
470	2502.74	II
260	2546.96	II
500	2549.88	II
460	2564.84	II
320	2603.31	II
950	2658.72	II
750	2676.95	II
1200	2688.04	II
410	2912.05	II
950	2996.65	II
500	3006.06	II

Cl I and II

Intensity	Wavelength	
950	3057.96	II
1300	3071.32	II
1400	3092.19	II
1200	3123.72	II
1900	3315.43	II
1200	3329.10	II
2500	3353.35	II
20	3726.54	I
1200	3749.96	II
1000	3781.17	II
1500	3798.76	II
1900	3805.18	II
1300	3809.46	II
1700	3820.20	II
2800	3827.59	II
4500	3833.35	II
2500	3843.20	II
3100	3845.37	II
3900	3845.65	II
1500	3845.80	II
10000	3850.99	II
7900	3851.37	II
1200	3851.65	II
25000	3860.83	II
4400	3860.99	II
1000	3861.37	II
1500	3913.87	II
1100	3916.63	II
20	3944.82	I
20	4104.79	I
10000 h	4132.50	II
65	4209.67	I
50	4226.42	I
60	4264.58	I
100	4363.27	I
100	4369.50	I
5000	4372.93	II
100	4379.90	I
100	4389.75	I
90	4390.40	I
90	4403.03	I
100	4438.49	I
90	4475.30	I
1500	4489.91	II
100	4526.19	I
80	4600.98	I
40	4623.938	I
50	4654.040	I
80	4661.208	I
45	4691.523	I
40	4721.255	I
45	4740.729	I
4300	4768.65	II
13000	4781.32	II
99000	4794.55	II
29000	4810.06	II
16000	4819.47	II
81000	4896.77	II
47000	4904.78	II
26000	4917.73	II
10000	4995.48	II
26000	5078.26	II
30	5099.789	I
56000	5217.94	II
23000	5221.36	II
15000	5392.12	II
99000	5423.23	II
10000	5423.51	II
19000	5443.37	II

Cl I and II

Intensity	Wavelength	
10000	5444.21	II
5600	5457.02	II
40	5532.162	I
50 d	5796.305	I
45	5799.914	I
30	5856.742	I
100 d	5948.58	I
50	6019.812	I
35	6082.61	I
1900	6094.69	II
160	6114.43	I
200	6140.245	I
160	6194.757	I
160	6398.66	I
150	6434.833	I
150	6531.43	I
1400	6661.67	II
150	6678.43	I
1300	6686.02	II
1200	6713.41	II
150	6840.29	I
300	6932.903	I
300	6981.886	I
600	7086.814	I
7500	7256.62	I
5000	7414.11	I
550	7462.370	I
550	7489.47	I
700	7492.118	I
11000	7547.072	I
2300	7672.42	I
450	7702.828	I
7000	7717.581	I
10000	7744.97	I
2200	7769.16	I
650	7771.09	I
2200	7821.36	I
1700	7830.75	I
3000	7878.22	I
220	7893.34	I
2300	7899.31	I
1800	7915.08	I
3000	7924.645	I
2100	7933.89	I
1700	7935.012	I
650	7952.52	I
1500	7974.72	I
1300	7976.97	I
600	7980.60	I
2900	7997.85	I
2200	8015.61	I
1100	8023.33	I
400	8051.07	I
1700	8084.51	I
2200	8085.56	I
3000	8086.67	I
1300	8087.73	I
250	8094.67	I
2500	8194.42	I
2200	8199.13	I
2200	8200.21	I
800	8203.78	I
18000	8212.04	I
3000	8220.45	I
20000	8221.74	I
18000	8333.31	I
1000	8360.71	II
560	8361.84	II
99900	8375.94	I

Cl I and II

Intensity	Wavelength	
180	8382.67	II
100	8392.02	II
400	8406.199	I
15000	8428.25	I
2200	8467.34	I
2200	8550.44	I
20000	8575.24	I
750	8578.02	I
75000	8585.97	I
450	8628.54	I
300	8641.71	I
3500	8686.26	I
2200	8912.92	I
3000	8948.06	I
2000	9038.982	I
2500	9045.43	I
1000	9069.656	I
2000	9073.17	I
7500	9121.15	I
3000	9191.731	I
500	9197.596	I
4000	9288.86	I
1500	9393.862	I
3500	9452.10	I
500	9486.964	I
1000	9584.801	I
3500	9592.22	I
250	9632.509	I
1000	9702.439	I
250	9744.426	I
200	9807.057	I
400	9875.970	I
331	10392.549	I
38	10432.83	II
10	10506.62	II
14	10509.12	II
19	10512.46	II
25	10514.17	II
9	10801.47	II
5	10885.42	II
1	10955.71	II
300	11123.05	I
231	11392.62	I
269	11409.69	I
1000	11436.33	I
180	11720.56	I
195	11866.76	I
172	12021.7	I
350	13243.8	I
310	13296.0	I
550	13346.8	I
525	13821.7	I
148	14369.7	I
294	14931.7	I
269	15108.0	I
381	15465.1	I
169	15467.6	I
1094	15520.3	I
1487	15730.1	I
193	15818.4	I
2780	15869.7	I
277	15883.3	I
342	15928.9	I
735	15960.0	I
283	15970.5	I
129	16077.6	I
259	16198.5	I
227	19370.3	I
717	19755.3	I

Cl I and II

Intensity	Wavelength	
185	19766.8	I
227	20199.4	I
85	20370.1	I
100	24470.0	I
	39603.7	I
	39615.3	I
	39716.0	I
	39744.0	I
	39750.9	I
	39875.3	I
	39881.0	I
	39985.7	I
	40085.5	I
	40089.5	I
	40171.0	I
	40310.3	I
	40335.4	I
	40532.2	I

Cl III

Refs. 28,30 - L.J.R. Vacuum

100	406.27	III
400	411.37	III
400	411.81	III
600	556.23	III
700	556.61	III
700	557.12	III
700	561.53	III
700	561.68	III
700	561.74	III
500	606.35	III
400	621.28	III
300	670.38	III
300	673.13	III
100	936.28	III
500	1005.28	III
600	1008.78	III
700	1015.02	III
600	1822.50	III
500	1828.40	III
500	1901.61	III
500	1983.61	III
	Air	
400	2006.84	III
700	2253.07	III
500	2268.95	III
500	2278.34	III
700	2283.93	III
600	2323.50	III
500	2336.45	III
600	2340.64	III
600	2359.67	III
600	2370.37	III
700	2416.42	III
600	2447.14	III
600	2448.58	III
500	2486.91	III
500	2532.48	III
600	2580.67	III
500	2603.59	III
500	2632.67	III
500	2633.18	III
600	2665.54	III
700	2710.37	III
600	2965.56	III
600	3104.46	III
800	3139.34	III
900	3191.45	III

Cl III

Intensity	Wavelength	
700	3289.80	III
700	3320.57	III
800	3329.06	III
900	3340.42	III
800	3392.89	III
800	3393.45	III
900	3530.03	III
800	3560.68	III
900	3602.10	III
800	3612.85	III
700	3622.69	III
700	3656.95	III
700	3670.28	III
700	3682.05	III
600	3705.45	III
600	3707.34	III
800	3720.45	III
800	3748.81	III
500	3779.35	III
500	3925.87	III
700	3991.50	III
600	4018.50	III
600	4059.07	III
500	4104.23	III
500	4106.83	III
400	4370.91	III
500	4608.21	III
300	4703.14	III
100	4863.75	III
10	4971.64	III

Cl IV

Refs. 11,28,30,31 - L.J.R. Vacuum

300	319.62	IV
200	331.84	IV
400	437.83	IV
400	464.86	IV
800	486.17	IV
800	534.73	IV
700	535.67	IV
600	536.15	IV
900	537.61	IV
600	538.12	IV
500	549.22	IV
400	550.02	IV
700	552.02	IV
600	553.30	IV
700	554.62	IV
500	601.50	IV
500	604.59	IV
400	608.90	IV
400	612.07	IV
400	653.70	IV
400	745.21	IV
400	831.43	IV
500	834.84	IV
500	834.97	IV
400	840.81	IV
600	840.93	IV
	865.3	IV
500	973.21	IV
600	977.56	IV
400	977.90	IV
700	984.95	IV
400	985.75	IV
300	1537.21	IV
200	1539.30	IV
200	1545.19	IV

Cl IV

Intensity	Wavelength	
200	1549.15	IV
200	1622.86	IV
	Air	
400	2701.36	IV
500	2724.03	IV
500	2751.23	IV
400	2770.64	IV
700	2782.47	IV
400	2835.4	IV
500	3063.13	IV
600	3076.68	IV
200	3167.87	IV

Cl V

Refs. 11,28,30,85,233 - L.J.R. Vacuum

300	287.33	V
300	373.78	V
400	390.15	V
500	392.43	V
300	536.53	V
400	537.01	V
300	537.46	V
500	538.03	V
400	538.68	V
800	542.23	V
600	542.30	V
400	542.87	V
1000	545.11	V
600	546.33	V
1000	547.63	V
400	633.19	V
400	635.32	V
400	681.92	V
400	683.17	V
400	688.93	V
	715.55	V
	716.19	V
400	883.13	V
400	894.34	V
100	894.91	V
	914.5	V

CHROMIUM (Cr)

Z = 24

Cr I and II

Ref. 1 - C.H.C. Air

19000	2055.52	II
14000	2061.49	II
8900	2065.42	II
80 h	2364.71	I
130	2383.33	I
140	2408.62	I
170	2496.31	I
110	2502.53	I
190	2504.31	I
50	2508.11	I
60	2508.98	I
40	2513.62	I
110	2516.92	I
80	2518.71	I
390	2519.52	I
190	2527.12	I
40	2530.45	I
70	2534.34	II
50	2545.64	I

Cr I and II			Cr I and II			Cr I and II			Cr I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
160	2549.54	I	22	2754.90	I	55	2889.82	II	170	3029.16	I
40	2553.06	I	22	2755.27	I	55	2891.42	I	710	3030.24	I
80	2557.15	I	22	2756.75	I	370	2893.25	I	140	3031.35	I
130	2560.69	I	150	2757.10	I	190	2894.17	I	28	3032.93	II
150	2571.74	I	350	2757.72	II	55	2896.46	II	390	3034.19	I
100	2577.65	I	60	2758.98	II	210	2896.75	I	550	3037.04	I
50	2588.20	I	80	2759.39	II	55 d	2897.67	II	80	3039.78	I
380	2591.85	I	45	2759.73	II		2897.73	II	550	3040.85	I
35	2603.57	I	90 h	2761.76	I	90	2898.54	II		3040.91	II
35	2622.86	I	750	2762.59	II	80	2899.21	I	55	3041.74	II
22	2625.32	I	22	2763.06	I	55	2899.48	II	110	3050.14	II
18	2626.60	I	80 h	2764.35	I	26	2903.97	II	710	3053.88	I
18	2629.82	I	750	2766.54	II	55	2904.68	I	24	3059.52	II
35	2642.12	I	22	2767.54	I	180	2905.49	I	85	3065.07	I
250	2653.59	II	250 h	2769.92	I	260	2909.05	I	28	3067.16	II
250	2658.59	II	18	2771.45	I	260	2910.90	I	85	3073.68	I
70	2661.73	II	45	2778.06	II	250	2911.14	I	55	3077.83	I
320	2663.42	II	22	2779.14	I	45	2911.68	II	28	3095.86	I
70	2663.68	II	80	2780.30	II	60	2913.73	I	28	3109.34	I
440	2666.02	II	610	2780.70	I	22	2915.23	II	28	3110.86	I
280	2668.71	II	70	2785.70	II	22	2915.46	II	240	3118.65	II
350	2671.81	II	35	2787.63	II	90	2921.24	II	45	3119.25	I
280	2672.83	II	35	2787.84	I	60	2921.82	II	40	3119.71	I
1800	2677.16	II	90	2792.16	II	60	2927.08	II	430	3120.37	II
35	2678.16	I	55	2798.67	II	80	2928.15	II	28	3122.60	II
320	2678.79	II	70	2800.77	II	95	2928.30	II	470	3124.94	II
18	2680.34	II	80	2812.01	II	26	2929.44	II		3125.02	II
230	2687.09	II	60	2818.36	II	35	2930.85	II	120	3128.70	II
60	2688.04	I	45	2822.01	II	26	2932.70	II	590	3132.06	II
55	2688.29	II	180	2822.37	II	55	2933.97	II	140	3136.68	II
26	2690.26	I	22	2826.75	I	90	2935.14	II	140	3147.23	II
280	2691.04	II	180	2830.47	II	45	2940.22	II	85	3148.44	I
35	2693.52	II	70	2834.26	II	60	2946.84	II	100	3155.15	I
35	2697.91	II	2500	2835.63	II	55	2953.36	II	100	3163.76	I
180	2698.41	II	45	2836.48	II	45	2953.71	II	240	3180.70	II
180	2698.69	II	55	2838.79	II	55	2961.73	II	30	3181.43	II
18	2700.60	I	110	2840.02	II	45	2966.05	II	65 h	3188.01	I
110	2701.99	I	1700	2843.25	II	480	2967.64	I	220	3197.08	II
18	2702.53	I	22	2846.02	I	480	2971.11	I	24	3198.11	I
70	2703.48	I	45	2849.29	I	210	2971.91	II	30	3208.59	II
	2703.55	II	1200	2849.84	II	480	2975.48	I	170	3209.18	II
35	2703.86	II	120	2851.36	II	30	2976.72	II	140	3217.40	II
18	2705.43	I	55	2853.22	II	190	2979.74	II	30	3229.20	I
60	2708.79	II	55	2855.07	II	350	2980.79	I	28	3234.06	II
35	2709.31	II	880	2855.68	II	110	2985.32	II	65	3237.73	I
140	2712.31	II	90	2856.77	II	480	2985.85	I	120	3245.54	I
45	2716.18	I	70	2857.40	II	1500	2986.00	I	130	3251.84	I
55	2717.51	II	610	2858.91	II	2100	2986.47	I	130	3257.82	I
45	2718.43	II	440	2860.93	II	660	2988.65	I	95	3259.98	I
170	2722.75	II	790	2862.57	II	160	2989.19	II	30	3295.43	II
18	2724.04	II	750	2865.11	II	480	2991.89	I	24	3307.02	II
420 h	2726.51	I	55	2865.33	II	230	2994.07	I	55	3324.06	II
45	2727.26	II	610	2866.74	II	300	2995.10	I	28	3326.59	I
280 h	2731.91	I	90	2867.10	II	700	2996.58	I	30	3328.35	II
170 h	2736.47	I	480	2867.65	II	210	2998.79	I	30	3329.05	I
70	2739.38	I	210	2870.44	II	1100	3000.89	I	95	3336.33	II
70	2740.10	II	110	2871.63	I	750	3005.06	I	130	3339.80	II
95	2741.07	I	160	2873.48	II	140	3013.03	I	110	3342.59	II
95	2742.03	II	90	2873.82	II	710	3013.71	I	30	3343.34	I
95	2742.17	I	320	2875.99	II	710	3014.76	I	95	3346.02	I
250	2743.64	II	230	2876.24	II	1400	3014.92	I	95	3346.74	I
35	2746.21	II	180	2877.98	II	710	3015.19	I	95	3347.84	II
110 h	2748.29	I	70	2878.45	II	2800	3017.57	I	65	3349.07	I
330	2748.98	II	120	2879.27	I	430	3018.50	I	55	3349.32	I
390	2750.73	II	95	2880.87	II	240	3018.82	I	30	3351.60	I
45	2751.60	I	30	2881.14	I	430	3020.67	I	55	3351.97	I
280	2751.87	II	170	2887.00	I	2800	3021.56	I	55 h	3353.03	I
110 h	2752.88	I	55	2888.74	II	1100	3024.35	I		3353.13	II
35	2754.28	II	700	2889.29	I	85	3026.65	II	170	3358.50	II

Cr I and II			Cr I and II			Cr I and II			Cr I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
160	3360.30	II	350	3636.59	I	660	3883.29	I	140	4163.62	I
65	3361.77	II	630	3639.80	I	50	3883.66	I	70	4165.52	I
55	3362.21	I	85	3640.39	I	570	3885.22	I	40	4169.84	I
430	3368.05	II	70	3641.47	I	380	3886.79	I	35	4170.20	I
30	3376.40	I	220	3641.83	I	60	3891.93	I	40	4172.77	I
55	3378.34	II	45	3646.16	I	260	3894.04	I	170	4174.80	I
30	3379.17	I	85	3648.53	I	40	3897.65	I	30	4175.94	I
30	3379.37	II	220	3649.00	I	35	3902.11	I	170	4179.26	I
95	3379.83	II	170	3653.91	I	360	3902.92	I	35	4184.90	I
140	3382.68	II	220	3656.26	I	60	3903.16	I	30	4186.36	I
95	3391.43	II	45	3662.84	I	960	3908.76	I	35	4190.13	I
55	3392.99	II	130	3663.21	I	120hd	3911.82	I	85	4191.27	I
70	3393.84	II	45	3665.98	I		3912.00	I	35	4192.10	I
55	3394.30	II	95	3666.64	I	120	3915.84	I	85	4193.66	I
30	3402.40	II	55	3668.03	I	190	3916.24	I	70	4194.95	I
170	3403.32	II	65	3676.32	I	35	3917.60	I	40	4197.23	I
360	3408.76	II	40	3677.68	II	1900	3919.16	I	85	4198.52	I
210	3421.21	II	55	3677.89	II	600	3921.02	I	60	4203.59	I
270	3422.74	II	40	3679.82	I	30	3926.65	I	40	4204.47	I
140	3433.31	II	19	3681.69	I	600	3928.64	I	35	4208.36	I
270	3433.60	I	120	3685.55	I	410	3941.49	I	110	4209.37	I
55	3434.11	I	130	3686.80	I	30	3951.10	I	40	4209.76	I
160	3436.19	I	130	3687.25	I	40	3952.40	I	40	4211.35	I
70	3441.12	I	75	3687.54	I	35	3953.16	I	40	4216.36	I
140	3441.44	I	19	3688.46	I	1900	3963.69	I	85	4217.63	I
30	3443.79	I	75	3712.95	II	120	3969.06	I	40	4221.57	I
170	3445.62	I	40	3716.53	I	1600	3969.75	I	40	4222.73	I
30	3447.02	I	130	3730.81	I	85	3971.26	I	40	4238.96	I
170	3447.43	I	150	3732.03	I	1600	3976.66	I	60	4240.70	I
70	3447.76	I	95	3742.97	I	85	3978.68	I	20000	4254.35	I
190	3453.33	I	480	3743.58	I	40	3979.80	I	70	4255.50	I
40	3453.74	I	570	3743.88	I	85	3981.23	I	60	4261.35	I
130	3455.60	I	85	3744.49	I	960	3983.91	I	110	4263.14	I
100	3460.43	I	55	3748.61	I	190	3984.34	I	30	4271.06	I
65	3465.25	I	340	3749.00	I	160	3989.99	I	40	4272.91	I
40	3467.02	I	50	3757.17	I	960	3991.12	I	16000	4274.80	I
70	3467.72	I	230	3757.66	I	160	3991.67	I	85	4280.40	I
45	3469.59	I	60	3758.04	I	190	3992.84	I	10000	4289.72	I
16	3472.76	I	24	3767.43	I	40	3993.97	I	40	4291.96	I
24	3472.91	I	260	3768.24	I	160	4001.44	I	85	4295.76	I
40	3473.61	I	95	3768.73	I	120	4012.47	II	70	4297.74	I
70	3481.30	I	95	3788.86	I	30	4014.67	I	35	4300.51	I
55	3481.54	I	95	3790.45	I	85	4022.26	I	50	4301.18	I
55	3494.97	I	130	3791.38	I	70	4025.01	I	30	4305.45	I
40	3495.38	II	130	3792.14	I	120	4026.17	I	35	4319.64	I
80	3510.54	I	120	3793.29	I	85	4027.10	I	60	4325.08	I
40	3511.84	II	130	3793.88	I	85	4030.68	I	780	4337.57	I
120	3550.64	I	85	3794.61	I	190	4039.10	I	1100	4339.45	I
80	3558.52	I	140	3797.13	I	160	4048.78	I	380	4339.72	I
130	3566.16	I	200	3797.72	I	120	4058.77	I	60	4340.13	I
130	3573.64	I	530	3804.80	I	40	4065.72	I	1900	4344.51	I
80	3574.04	I	110	3806.83	I	85	4066.94	I	70	4346.83	I
330 h	3574.80	I	110	3807.93	I	35	4074.86	I	380	4351.05	I
	3574.94	I	180	3815.43	I	40	4076.06	I	2300	4351.77	I
19000	3578.69	I	70	3818.48	I	40	4077.09	I	570	4359.63	I
160 h	3584.33	I	180	3819.56	I	40	4077.68	I	70	4363.13	I
130	3585.30	II	70	3823.52	I	40	4104.87	I	530	4371.28	I
17000	3593.49	I	130	3826.42	I	40	4109.58	I	70	4373.25	I
350	3601.67	I	130	3830.03	I	40	4120.61	I	110	4374.16	I
40	3602.57	I	380	3841.28	I	40	4121.82	I	70	4375.33	I
85	3603.74	I	190	3848.98	I	35	4122.16	I	50	4381.11	I
	3603.78	II	140	3849.36	I	40	4123.39	I	530	4384.98	I
13000	3605.33	I	290	3850.04	I	140	4126.52	I	60	4387.50	I
40	3608.40	I	140	3852.22	I	35	4127.30	I	70	4391.75	I
40	3609.48	I	190	3854.22	I	40	4127.64	I	60	4403.50	I
40	3610.05	I	110	3855.29	I	40	4131.36	I	24	4410.30	I
70	3612.61	I	140	3855.57	I	30	4152.78	I	60	4411.09	I
85	3615.64	I	260	3857.63	I	120	4153.82	I	35	4412.25	I
130	3632.84	I	70	3874.53	I	85	4161.42	I	50	4413.87	I

Cr I and II		
Intensity	Wavelength	
60	4424.28	I
24	4428.50	I
50	4430.49	I
50	4432.18	I
110	4458.54	I
30	4459.74	I
30	4465.36	I
30	4482.88	I
40	4488.05	I
50	4489.47	I
60	4492.31	I
660	4496.86	I
50	4498.73	I
70	4500.30	I
50	4501.11	I
22	4501.79	I
24	4506.85	I
95	4511.90	I
12	4514.37	I
35	4514.53	I
24	4521.14	I
24	4526.11	I
380	4526.47	I
70 d	4527.34	I
	4527.47	I
24	4529.85	I
380	4530.74	I
50	4535.15	I
240	4535.72	I
40	4539.79	I
240	4540.50	I
240	4540.72	I
35	4541.07	I
19	4541.51	I
24	4542.62	I
140	4544.62	I
24	4545.34	I
600	4545.96	I
50	4556.17	I
22	4558.66	II
19	4564.17	I
120	4565.51	I
95	4569.64	I
120	4571.68	I
22	4575.12	I
360	4580.06	I
24	4586.14	I
360	4591.39	I
70	4595.59	I
50	4600.10	I
480	4600.75	I
50	4601.02	I
240	4613.37	I
600	4616.14	I
70	4619.55	I
85	4621.96	I
70	4622.49	I
24	4622.76	I
550	4626.19	I
24	4632.18	I
40	4637.18	I
50	4637.77	I
50 d	4639.52	I
	4639.70	I
1600	4646.17	I
24	4646.81	I
24	4648.13	I
24	4648.87	I
35	4649.46	I

Cr I and II		
Intensity	Wavelength	
570	4651.28	I
840	4652.16	I
35	4654.74	I
19	4656.19	I
40	4663.33	I
70	4663.83	I
95	4664.80	I
35	4665.90	I
22	4666.22	I
70	4666.51	I
50	4669.34	I
40	4680.54	I
19	4680.87	I
70	4689.37	I
60	4693.95	I
24	4695.15	I
60	4697.06	I
240 d	4698.46	I
	4698.62	I
35	4700.61	I
190	4708.04	I
240	4718.43	I
50	4723.10	I
50	4724.42	I
50	4727.15	I
24	4729.72	I
120	4730.71	I
140	4737.35	I
19	4745.31	I
70	4752.08	I
340	4756.11	I
50	4764.29	I
22	4766.63	I
30	4767.86	I
190	4789.32	I
95	4792.51	I
120	4801.03	I
110	4829.38	I
14	4836.86	I
17	4861.20	I
70	4861.84	I
140	4870.80	I
35	4885.78	I
19	4885.96	I
130	4887.01	I
19	4888.53	I
35	4903.24	I
260	4922.27	I
110	4936.33	I
70	4942.50	I
110	4954.81	I
35	4964.93	I
60	5013.32	I
17	5051.90	I
17	5065.91	I
40	5067.71	I
40	5072.92	I
30	5110.75	I
17	5113.13	I
17	5123.46	I
50	5139.65	I
14	5144.67	I
70	5166.23	I
35	5177.43	I
70	5184.59	I
70	5192.00	I
12	5193.49	I
85	5196.44	I
35	5200.19	I

Cr I and II		
Intensity	Wavelength	
5300	5204.52	I
8400	5206.04	I
11000	5208.44	I
19	5214.13	I
30	5221.75	I
85	5224.94	I
12	5226.89	I
19	5238.97	I
30	5243.40	I
290	5247.56	I
60	5254.92	I
60	5255.13	I
19	5261.75	I
530	5264.15	I
30	5265.16	I
180	5265.72	I
35	5272.01	I
30	5273.44	I
95 h	5275.17	I
35 h	5275.69	I
70 h	5276.03	I
19	5280.29	I
10	5287.19	I
340	5296.69	I
70 h	5297.36	I
660	5298.27	I
85	5300.75	I
17	5304.21	I
24	5312.88	I
24	5318.78	I
340 h	5328.34	I
70 h	5329.17	I
17 h	5329.72	I
14	5340.44	I
10	5344.76	I
780	5345.81	I
380	5348.32	I
30	5386.98	I
22	5387.57	I
10	5390.39	I
40	5400.61	I
22	5405.00	I
1400	5409.79	I
12	5442.41	I
19	5463.97	I
19	5480.50	I
24	5628.64	I
7	5642.36	I
12 h	5649.37	I
24	5664.04	I
7 h	5681.20	I
7 h	5682.48	I
24	5694.73	I
40	5698.33	I
24	5702.31	I
12	5712.64	I
24	5712.78	I
7	5719.82	I
7	5746.43	I
7	5753.69	I
12 h	5781.20	I
6 h	5781.81	I
24 h	5783.11	I
30 h	5783.93	I
24 h	5785.00	I
19 h	5785.82	I
60 h	5787.99	I
180 h	5791.00	I
35	6330.10	I

Cr I and II		
Intensity	Wavelength	
22	6362.87	I
19	6661.08	I
11	6669.26	I
5 h	6881.62	I
10 h	6882.38	I
21 h	6883.03	I
27 h	6924.13	I
17 h	6925.20	I
30 h	6978.48	I
11 h	6979.82	I
7	7185.52	I
6 h	7236.20	I
85	7355.90	I
130	7400.21	I
150	7462.31	I
11 h	7942.04	I
5 h	8163.18	I
9	8348.28	I
6	8450.26	I
3	8455.24	I
6	8548.86	I
40	8947.15	I
19	8976.83	I

Cr III Ref. 412 - C.H.C. Vacuum		
20	969.26	III
40	1000.86	III
40	1001.04	III
30	1002.96	III
50	1017.14	III
50	1017.31	III
50	1017.57	III
30	1028.33	III
60	1030.47	III
30	1030.89	III
50	1033.23	III
50	1033.45	III
100	1033.69	III
50	1035.93	III
100	1036.03	III
30	1040.17	III
40	1040.53	III
40	1045.06	III
40	1045.14	III
60	1059.13	III
60	1060.15	III
60	1061.04	III
50	1062.68	III
30	1064.32	III
30	1064.43	III
50	1066.23	III
80	1068.41	III
30	1100.61	III
30	1101.43	III
30	1102.88	III
30	1117.19	III
30	1132.75	III
50	1136.67	III
50	1161.43	III
30	1187.65	III
60	1206.38	III
80	1209.13	III
80	1211.12	III
40	1221.07	III
40	1221.90	III
30	1225.65	III
30	1228.65	III

Cr III

Intensity	Wavelength	
30	1231.88	III
50	1232.96	III
40	1236.20	III
40	1238.51	III
50	1252.61	III
40	1259.02	III
40	1261.86	III
30	1262.34	III
35	1263.61	III
35	1264.21	III
40	1287.05	III
30	1455.27	III
40	1584.60	III
30	1603.19	III
30	1679.25	III
30	1690.28	III
60	1692.89	III
60	1696.64	III
60	1701.48	III
80	1707.43	III
40	1707.78	III
45	1762.81	III
30	1766.92	III
30	1769.17	III
30	1827.26	III
	Air	
60	2036.39	III
50	2039.63	III
80	2047.23	III
100	2113.73	III
100	2113.83	III
50	2114.26	III
50	2114.53	III
100	2114.87	III
100	2117.53	III
80	2123.53	III
80	2139.11	III
100	2141.15	III
80	2144.15	III
50	2147.16	III
50	2147.56	III
50	2148.65	III
50	2149.48	III
50	2152.76	III
100	2157.17	III
50	2163.86	III
60	2166.25	III
100	2170.70	III
50	2183.71	III
100	2185.01	III
50	2190.09	III
100	2190.76	III
100	2191.58	III
100	2197.89	III
100	2198.62	III
100	2203.22	III
60	2208.70	III
200	2226.72	III
100	2231.81	III
100	2233.81	III
200	2235.91	III
150	2237.59	III
150	2244.10	III
80	2251.45	III
50	2257.92	III
100	2273.30	III
80	2275.43	III
100	2276.38	III
80	2277.47	III

Cr III

Intensity	Wavelength	
150	2284.44	III
50	2289.23	III
80	2290.66	III
60	2295.55	III
50	2309.99	III
80	2314.63	III
100	2319.07	III
150	2324.88	III
60	2340.51	III
50	2456.83	III
100	2472.88	III
100	2479.77	III
100	2483.06	III
60	2488.26	III
80	2506.41	III
80	2530.99	III
80	2537.73	III
80	2544.37	III
50	2545.17	III
80	2564.76	III
80	2616.50	III
100	2626.08	III
100	2640.73	III
50	2647.50	III
40	2655.28	III
40	2916.57	III

Cr IV

Refs. 379,412 - C.H.C.

Vacuum

50	575.05	IV
30	576.24	IV
30	576.62	IV
30	595.09	IV
50	612.64	IV
40	613.75	IV
40	614.03	IV
40	614.90	IV
30	615.34	IV
30	615.60	IV
50	616.82	IV
40	618.23	IV
40	619.13	IV
100	620.66	IV
60	621.36	IV
40	622.09	IV
30	623.54	IV
40	625.04	IV
40	625.99	IV
100	629.26	IV
50	629.74	IV
80	630.30	IV
30	632.62	IV
30	637.34	IV
50	637.55	IV
50	638.13	IV
30	638.54	IV
100	666.55	IV
75	667.30	IV
40	677.55	IV
40	687.12	IV
50	688.46	IV
100	693.92	IV
50	695.21	IV
50	705.98	IV
30	712.90	IV
80	1055.89	IV
60	1057.85	IV
30	1367.39	IV

Cr IV

Intensity	Wavelength	
40	1375.05	IV
70	1401.82	IV
100	1417.42	IV
30	1485.05	IV
80	1595.04	IV
90 d	1595.59	IV
100	1658.08	IV
120	1672.66	IV
90	1686.07	IV
100	1690.88	IV
80	1725.26	IV
90	1727.07	IV
100	1732.04	IV
40	1733.98	IV
80	1734.16	IV
50	1739.19	IV
70	1746.88	IV
80	1747.13	IV
110	1755.64	IV
120	1758.51	IV
100	1769.64	IV
100	1777.82	IV
40	1791.09	IV
140	1802.72	IV
130	1812.41	IV
60	1819.23	IV
30	1826.21	IV
30	1826.86	IV
100	1840.14	IV
50	1851.89	IV
100	1863.11	IV
140	1873.89	IV
35	1883.16	IV
40	1937.63	IV
30	1946.59	IV
140	1967.18	IV
120	1972.07	IV
40	1990.25	IV
	Air	
50 d	2042.91	IV
40	2055.73	IV
70	2299.21	IV
90	2299.59	IV
100	2316.85	IV
40	2324.06	IV
50	2360.40	IV
70	2405.15	IV
60	2423.32	IV

Cr V

Ref. 380 - C.H.C.

Vacuum

100	438.62	V
100	464.02	V
50	469.64	V
50	825.60	V
50	968.70	V
50	1045.04	V
60	1060.65	V
50	1112.45	V
60	1114.35	V
100	1116.48	V
80	1117.56	V
50	1118.16	V
150	1121.07	V
150	1127.63	V
100	1193.95	V
80	1196.04	V
50	1210.50	V

Cr V

Intensity	Wavelength	
50	1259.99	V
100	1263.50	V
150	1465.86	V
50	1481.65	V
50	1482.76	V
50	1484.67	V
100	1489.71	V
150	1497.97	V
170	1519.03	V
220	1579.70	V
170	1591.72	V
150	1603.19	V
60	1638.50	V
50	1639.40	V
200	1837.44	V

COBALT (Co)

Z = 27

Co I and II

Refs. 1,125,276 - C.R.C.

Vacuum

20	1265.93	II
40	1271.94	II
20	1276.90	II
30	1293.97	II
25	1295.53	II
30	1295.86	II
20	1297.10	II
80	1299.58	II
30	1302.39	II
20	1306.76	II
80	1306.95	II
40	1311.12	II
40	1311.86	II
30	1315.42	II
30	1316.09	II
20	1318.19	II
30	1318.60	II
20	1319.84	II
20	1409.33	II
20	1466.21	II
20	1471.87	II
30	1472.90	II
30	1475.81	II
20	1484.26	II
30	1486.50	II
20	1509.23	II
20	1590.54	II
20	1595.77	II
20	1599.30	II
20	1693.34	II
8	1706.05	II
10	1723.01	II
15 h	1740.55	II
15	1743.39	II
8	1754.21	II
20 d	1808.01	II
10	1837.56	II
15	1839.37	II
1500	1842.34	I
1800	1847.89	I
1800	1852.71	I
2400	1855.05	I
1500	1878.28	I
10	1917.62	II
1800	1936.58	I
1500	1946.79	I

Co I and II			Co I and II			Co I and II			Co I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
30	1950.09	II	300	2301.40	II	200	2560.03	II	21000	3453.50	I
1500	1951.90	I	800 d	2307.85	II	960	2562.15	I	1000	3455.23	I
1800	1954.22	I	2600	2309.02	I	500	2564.04	II	5100	3462.80	I
1800	1955.17	I	500	2311.60	II	1100	2567.35	I	5100	3465.80	I
30	1957.42	II	500	2314.05	II	960	2574.35	I	8000	3474.02	I
1500	1958.55	I	300	2314.96	II	800	2580.32	II	1900	3483.41	I
1500	1961.59	I	200 p	2317.06	II	300 d	2582.22	II	4800	3489.40	I
1500 h	1968.69	I	2400	2323.14	I	500	2587.22	II	2400	3495.69	I
1500 h	1968.93	I	300 p	2324.31	II	500	2587.52	II	40	3497.33	II
3000	1970.71	I	200 d	2326.11	II	200	2588.91	II	50	3501.72	II
1800 h	1971.16	I	500	2326.47	II	100 p	2605.71	II	9600	3502.28	I
1800 h	1972.52	I	1400	2335.99	I	100	2612.50	II	7000	3506.32	I
1500	1973.85	I	1600	2338.67	I	100	2614.36	II	50	3507.77	II
1800	1976.97	I	200	2347.39	II	100 p	2628.77	II	2900	3509.84	I
2400 h	1980.89	I	1600	2352.85	I	100	2632.26	II	1400	3510.43	I
1500	1989.80	I	200 d	2353.41	II	100	2636.07	II	4800	3512.64	I
1800	1990.34	I	2000	2353.42	I	310	2646.42	I	3800	3513.48	I
1500 l	1998.49	I	500	2363.80	II	770	2648.64	I	10	3514.23	II
	Air		400	2378.62	II	100	2653.72	II	30	3517.50	II
20	2000.79	II	1400	2380.48	I	100	2663.53	II	4800	3518.35	I
1500	2002.32	I	200	2381.76	II	200	2666.73	II	1300	3520.08	I
900	2008.04	I	300 p	2383.45	II	100	2675.85	II	2700	3521.57	I
50	2011.51	II	1400	2384.86	I	100	2684.42	II	3800	3523.43	I
1200 h	2014.58	I	200	2386.36	II	100	2702.02	II	60	3523.51	II
900	2016.17	I	500	2388.92	II	200	2706.62	II	6400	3526.85	I
50	2022.35	II	200	2397.38	II	200	2707.35	II	2700	3529.03	I
40	2025.76	II	1100 d	2402.06	I	190	2715.99	I	7300	3529.81	I
50	2027.04	II	200 p	2404.16	II	100	2727.78	II	1900	3533.36	I
900	2031.96	I	5300	2407.25	I	80	2734.54	II	40	3535.92	II
30	2036.58	II	5300	2411.62	I	190	2745.10	I	50	3545.03	II
1500	2039.95	I	1600	2412.76	I	100	2753.22	II	20	3555.93	II
1200	2041.11	I	4800	2414.46	I	190	2764.19	I	1100	3560.89	I
20	2049.17	II	4800	2415.30	I	100	2766.70	II	80	3561.07	II
40	2058.82	II	300	2417.65	II	100	2774.97	II	20	3566.98	II
40	2063.78	II	4100	2424.93	I	100	2791.00	II	8800	3569.38	I
50	2065.54	II	3300	2432.21	I	100	2793.73	II	50	3574.95	II
1500 h	2077.76	I	2900	2436.66	I	150	2815.56	I	1600	3574.96	I
900	2085.67	I	2400	2439.05	I	80	2835.63	II	60	3575.32	II
900	2087.55	I	200	2442.63	II	80	2847.35	II	2500	3575.36	I
900	2089.35	I	200 d	2446.03	II	80	2871.22	II	60	3577.96	II
900	2093.40	I	200 p	2447.69	II	190	2886.44	I	1000	3585.16	I
900	2094.86	I	200	2450.00	II	100	2918.38	II	6700	3587.19	I
900	2095.77	I	200	2464.20	II	100	2930.24	II	1900	3594.87	I
1200	2097.51	I	200	2486.44	II	100	2954.73	II	1600	3602.08	I
1500	2104.73	I	200	2498.82	II	690	2987.16	I	100	3621.21	II
1500	2106.80	I	570	2504.52	I	690	2989.59	I	1000	3627.81	I
900	2108.98	I	500	2506.46	II	20	3008.86	II	80	3643.61	II
30	2111.44	II	360	2506.88	I	60	3022.59	II	10	3656.75	II
900 s	2117.68	I	200	2511.16	II	30	3035.13	II	60	3681.35	II
20	2128.79	II	860	2517.87	I	3100	3044.00	I	5	3695.32	II
900	2137.78	I	500	2519.82	II	1700	3061.82	I	5	3714.73	II
900	2138.97	I	4300	2521.36	I	20	3352.79	II	1100	3745.50	I
900	2163.03	I	200 h	2524.65	II	80	3387.70	II	20	3754.69	II
20	2164.44	II	300	2524.97	II	1100	3388.17	I	1400	3842.05	I
30	2173.33	II	500	2528.62	II	2200	3395.38	I	6900	3845.47	I
1100	2174.60	I	2900	2528.97	I	11000	3405.12	I	5500	3873.12	I
20	2181.99	II	200 p	2530.09	II	4500	3409.18	I	2800	3873.96	I
30	2187.01	II	720	2530.13	I	6700	3412.34	I	7900	3894.08	I
20	2190.68	II	860	2532.18	I	2200	3412.63	I	20 h	3911.40	II
20	2192.50	II	200 d	2533.82	II	30	3415.77	II	1500	3935.97	I
200	2193.60	II	2900	2535.96	I	2700	3417.16	I	80 h	3963.10	II
20	2200.40	II	860	2536.49	I	50	3423.84	II	40 h	3976.74	II
40 p	2202.95	II	300	2541.94	II	2500	3431.58	I	10	3983.02	II
200	2256.73	II	1700	2544.25	I	4500	3433.04	I	6000	3995.31	I
150	2260.00	II	200	2546.74	II	1600	3442.93	I	970	3997.91	I
200	2283.52	II	340	2548.34	I	8800	3443.64	I	350	4020.90	I
1000	2286.15	II	310	2553.37	I	50	3446.39	II	10 h	4036.14	II
200	2291.98	II	310	2555.07	I	4100	3449.17	I	20 h	4037.37	II
300 d	2293.38	II	300	2559.41	II	2100	3449.44	I	4	4040.02	II

Co I and II

Intensity	Wavelength	
370	4045.39	I
5 h	4050.23	II
10 h	4052.40	II
20 h	4062.73	II
2 h	4064.50	II
350	4066.37	I
5 h	4074.34	II
830	4092.39	I
1	4096.57	II
550	4110.54	I
2800	4118.77	I
4400	4121.32	I
3	4130.88	II
3	4145.13	II
3 d	4160.67	II
1	4181.13	II
90	4190.71	I
1	4208.61	II
30 s	4244.25	II
8	4272.33	II
20 h	4288.25	II
3	4328.86	II
2	4384.26	II
2 h	4396.94	II
3	4413.91	II
90	4469.56	I
10	4482.50	II
2 h	4489.12	II
4 h	4497.44	II
10 d	4500.54	II
0	4516.65	II
690	4530.96	I
2 h	4533.22	II
0 h	4537.95	II
90	4549.66	I
1 h	4559.29	II
140	4565.59	I
1	4569.26	II
190	4581.60	I
5	4616.30	II
120	4629.38	I
25 h	4660.66	II
85	4663.41	I
110	4792.86	I
10 d	4831.16	II
100	4840.27	I
150	4867.88	I
80 h	4964.18	II
10 h	4970.05	II
10 h	4990.47	II
20 h	4995.98	II
35	5146.74	I
50	5212.71	I
50	5230.22	I
45	5235.21	I
50	5247.93	I
26	5266.30	I
45	5266.49	I
26	5268.52	I
45 h	5280.65	I
26	5301.06	I
50	5342.71	I
26	5343.39	I
50	5352.05	I
26	5353.48	I
35	5369.58	I
45	5483.34	I
17	5530.77	I
17	5647.22	I

Co I and II

Intensity	Wavelength	
17	5991.88	I
17	6082.44	I
17	6282.63	I
45	6450.24	I
21	6455.00	I
15	6563.42	I
15	6632.44	I
14	6814.94	I
14	6872.40	I
21	7052.89	I
45	7084.99	I
8	7417.38	I
8	7712.68	I
7	7908.71	I
9	7987.38	I
13	8007.27	I
9	8093.96	I
9	8372.84	I
4	8575.35	I
3	8819.15	I

Co III

Ref. 291 – C.R.C.

Vacuum

1000	1696.01	III
800	1697.99	III
500	1702.79	III
1000	1707.35	III
500	1707.95	III
500	1723.97	III
400	1745.67	III
500	1755.98	III
5000	1760.35	III
500	1769.96	III
500	1773.22	III
5000	1773.57	III
500	1774.42	III
1000	1777.14	III
2000	1780.05	III
3000	1782.97	III
500	1784.06	III
1000	1787.08	III
1000	1789.07	III
500	1790.26	III
500	1791.28	III
500	1798.06	III
500	1805.54	III
400	1811.47	III
400	1821.26	III
400	1821.69	III
400	1821.77	III
1000	1823.08	III
400	1825.36	III
750	1825.95	III
2000	1830.09	III
2000	1831.44	III
750	1831.92	III
400	1832.20	III
5000	1835.00	III
1000	1837.63	III
500	1846.16	III
500	1852.92	III
400	1854.39	III
400	1854.76	III
1000	1861.78	III
2000	1863.83	III
400	1864.19	III
500	1871.87	III
1000	1881.70	III

Co III

Intensity	Wavelength	
500	1895.37	III
500	1919.12	III
500	1928.57	III
500	1940.15	III
500	1953.94	III
500	1959.41	III
400	1989.60	III

Air

100	2001.09	III
200	2011.62	III
200	2013.88	III
100	2031.81	III
200	2053.11	III
100	2056.21	III
10	2062.17	III
10	2079.74	III
15	2088.58	III
10	2090.51	III
10	2097.63	III
10	2134.15	III
10	2452.16	III
20	2811.75	III
10	2888.31	III
10	2933.27	III
10	2978.01	III
20	2991.89	III
25	3010.92	III
10	3116.68	III
2	3151.40	III
2	3180.64	III
20	3232.11	III
2	3249.24	III
20	3259.68	III
2	3269.23	III
10	3287.68	III
15	3305.38	III
10	3451.25	III
2	3526.24	III
1	3634.21	III
1	3636.31	III
2	3667.52	III
2	3677.23	III
3	3680.74	III
1	3762.50	III
15	3782.27	III

Co IV

Ref. 236 – C.R.C.

Vacuum

81	606.79	IV
74	607.59	IV
55	608.24	IV
66	609.16	IV
70	609.21	IV
64	609.28	IV
43	610.04	IV
37	610.25	IV
24	610.79	IV

Co V

Refs. 100,159 – C.R.C.

Vacuum

20	355.52	V
18	355.88	V
12	356.06	V
4	1006.86	V
10	1007.51	V
15	1009.02	V
10	1010.94	V
10	1013.80	V

Co V

Intensity	Wavelength	
1	1017.43	V
10	1018.36	V
10	1021.14	V
1	1028.08	V
3	1226.31	V
8	1228.19	V
15	1231.73	V
2	1234.55	V
20	1236.95	V
2	1239.85	V
8	1246.91	V
6	1258.61	V
5	1263.28	V
20	1270.70	V
20	1272.23	V
2	1275.52	V
50	1277.01	V
30	1281.63	V
15	1284.00	V
28	1286.95	V
25	1295.55	V
40	1295.87	V
35	1301.12	V
50	1345.67	V
6	1351.22	V
15	1353.42	V
40	1355.20	V
30	1357.67	V
20	1361.32	V
30	1362.46	V
30	1364.17	V
30	1368.24	V
4	1369.30	V
10	1371.01	V
30	1373.09	V
30	1375.20	V
25	1378.12	V
10	1379.05	V
10	1380.21	V
32	1389.11	V
15	1459.77	V
35	1468.98	V
30	1476.65	V
25	1482.62	V
20	1482.91	V
25	1486.02	V
20	1488.73	V

COPPER (Cu)

Z = 29

Cu I and II

Refs. 273,290 – V.K.

Vacuum

80	685.141	II
100	709.313	II
100	718.179	II
150	724.489	II
200	735.520	II
250	736.032	II
80	779.295	II
100	797.455	II
150	810.998	II
200	813.883	II
300	826.996	II
150	848.808	II
250	851.303	II
250	858.487	II

Cu I and II			Cu I and II			Cu I and II			Cu I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
400	861.994	II	150	1265.506	II	200	1540.239	II	320	2117.310	II
400	865.390	II	300	1275.572	II	300	1540.389	II	350	2122.980	II
250	869.336	II	150	1282.455	II	300	1540.588	II	350	2126.044	II
150	873.263	II	150	1287.468	II	750	1541.703	II	420	2134.341	II
200	876.723	II	150	1298.395	II	400	1544.677	II	900	2135.981	II
250	877.012	II	300	1308.297	II	100	1547.958	II	400	2148.984	II
200	877.555	II	300	1314.337	II	300	1550.653	II	150	2161.320	II
500	878.699	II	100	1320.686	II	300	1551.389	II	1300 r	2165.09	I
100	884.133	II	100	1326.395	II	500	1552.646	II	250	2174.982	II
250	885.847	II	150	1350.594	II	250	1553.896	II	1600 r	2178.94	I
600	886.943	II	250	1351.837	II	400	1555.134	II	700	2179.410	II
600	890.567	II	150	1355.305	II	500	1555.703	II	1700 r	2181.72	I
500	892.414	II	300	1358.773	II	300	1558.345	II	700	2189.630	II
800	893.678	II	200	1359.009	II	400	1565.924	II	900	2192.268	II
400	894.227	II	200	1362.600	II	400	1566.415	II	400	2195.683	II
600	896.759	II	250	1367.951	II	100	1569.416	II	1700 r	2199.58	I
400	896.976	II	200	1371.840	II	300	1579.492	II	1300 r	2199.75	I
600	901.073	II	100	1393.128	II	300	1580.626	II	100	2200.509	II
400	906.113	II	100	1398.642	II	400	1581.995	II	200	2209.806	II
800	914.213	II	150	1402.777	II	500	1583.682	II	750	2210.268	II
600	922.019	II	150	1407.169	II	400	1590.165	II	1600 r	2214.58	I
500	924.239	II	100	1414.898	II	600	1593.556	II	250	2215.106	II
400	935.232	II	250	1418.426	II	400	1598.402	II	1000 r	2215.65	I
600	935.898	II	250	1421.759	II	400	1602.388	II	750	2218.108	II
600	943.335	II	200	1427.829	II	200	1604.848	II	2100 r	2225.70	I
600	945.525	II	400	1430.243	II	300	1605.281	II	150	2226.780	II
500	945.965	II	250	1434.904	II	400	1606.834	II	1600 r	2227.78	I
200	954.383	II	150	1436.236	II	250	1608.639	II	350	2228.868	II
250	956.290	II	150	1442.139	II	150	1610.296	II	2500 r	2230.08	I
400	958.154	II	200	1445.984	II	200	1617.915	II	1100 r	2238.45	I
200	960.414	II	200	1449.058	II	600	1621.426	II	900	2242.618	II
250	968.042	II	250	1450.304	II	400	1622.428	II	2300 r	2244.26	I
200	974.759	II	200	1452.294	II	250	1630.268	II	1000	2247.002	II
250	977.567	II	300	1458.002	II	100	1636.605	II	1300 r	2260.53	I
100	987.657	II	250	1459.412	II	250	1649.458	II	2200 r	2263.08	I
250	992.953	II	200	1463.752	II	30 r	1655.32	I	150	2263.786	II
300	1004.055	II	400	1463.838	II	200	1656.322	II	200	2276.258	II
300	1008.569	II	200	1466.070	II	200	1660.001	II	100	2286.645	II
300	1008.728	II	400	1470.697	II	300	1663.002	II	2500 r	2293.84	I
300	1010.269	II	200	1472.395	II	100	1672.776	II	170	2294.368	II
250	1012.597	II	250	1473.978	II	30	1688.09	I	1000	2303.12	I
500	1018.707	II	200	1474.935	II	30	1691.08	I	150	2369.890	II
500	1027.831	II	150	1476.059	II	30 r	1703.84	I	2500 r	2392.63	I
250	1028.328	II	200	1481.544	II	50 r	1713.36	I	120	2403.337	II
200	1030.263	II	200	1485.328	II	150	1717.721	II	1500	2406.66	I
600	1036.470	II	750	1488.831	II	50 r	1725.66	I	1000 r	2441.64	I
600	1039.348	II	300	1492.834	II	100	1736.551	II	100	2485.792	II
600	1039.582	II	250	1493.366	II	50 r	1741.57	I	2000 r	2492.15	I
800	1044.519	II	250	1495.430	II	150	1753.281	II	150	2506.273	II
800	1044.744	II	350	1496.687	II	200 r	1774.82	I	120	2526.593	II
500	1049.755	II	150	1503.368	II	100 r	1825.35	I	300	2544.805	II
600	1054.690	II	250	1504.757	II	250	1929.751	II	100	2571.756	II
400	1055.797	II	200	1505.388	II	250	1944.597	II	150	2590.529	II
600	1056.955	II	300	1508.632	II	100	1946.493	II	200	2600.270	II
400	1058.799	II	350	1510.506	II	200	1957.518	II	2500 r	2618.37	I
600	1059.096	II	200	1512.465	II	150	1970.495	II	200	2666.291	II
600	1060.634	II	200	1513.366	II	150	1977.027	II	750	2689.300	II
600	1063.005	II	500	1514.492	II	500	1979.956	II	700	2700.962	II
200	1065.782	II	200	1517.631	II	300	1989.855	II	650	2703.184	II
200	1066.134	II	500	1519.492	II		Air		700	2713.508	II
500	1069.195	II	600	1519.837	II	250	1999.698	II	650	2718.778	II
300	1073.745	II	200	1520.540	II	270	2035.854	II	300	2721.677	II
200	1088.395	II	200	1524.860	II	250	2037.127	II	120	2737.342	II
300	1094.402	II	150	1525.764	II	350	2043.802	II	270	2745.271	II
250	1097.053	II	500	1531.856	II	300	2054.980	II	2500 r	2766.37	I
150	1119.947	II	300	1532.131	II	100	2078.663	II	800	2769.669	II
200	1142.640	II	250	1533.986	II	110	2098.398	II	200	2791.795	II
300	1144.856	II	250	1535.002	II	320	2104.797	II	170	2799.528	II
100	1250.048	II	500	1537.559	II	300	2112.100	II	100	2810.804	II

Cu I and II		
Intensity	Wavelength	
1250 r	2824.37	I
350	2837.368	II
100	2857.748	II
600	2877.100	II
270	2884.196	II
2500 r	2961.16	I
100	2986.335	II
2000	2997.36	I
2000	3010.84	I
2500	3036.10	I
2500	3063.41	I
1400	3073.80	I
1500	3093.99	I
1250	3099.93	I
2000	3108.60	I
1400 h	3126.11	I
1500	3194.10	I
1400	3208.23	I
1500 h	3243.16	I
10000 r	3247.54	I
10000 r	3273.96	I
1400 h	3282.72	I
400	3290.418	II
1500 h	3290.54	I
110	3300.881	II
250	3301.229	II
2500 h	3307.95	I
200	3316.276	II
1500	3337.84	I
150	3338.648	II
200	3365.648	II
450	3370.454	II
300	3374.952	II
200	3380.712	II
100	3384.945	II
1250 h	3483.76	I
1250	3524.23	I
2000	3530.38	I
1400	3599.13	I
1400	3602.03	I
1000	3686.555	II
150	3786.270	II
170	3797.849	II
100	3818.879	II
140	3826.921	II
160	3864.137	II
280	3884.131	II
150	3892.924	II
170	3903.177	II
140	3920.654	II
120	3933.268	II
120	3987.024	II
150	3993.302	II
140	4003.476	II
1250	4022.63	I
100	4032.647	II
600	4043.484	II
500	4043.751	II
2000	4062.64	I
120	4068.106	II
500	4131.363	II
200	4143.017	II
300	4153.623	II
500	4161.140	II
370	4164.284	II
400	4171.851	II
500	4179.512	II
500	4211.866	II
320	4230.449	II

Cu I and II		
Intensity	Wavelength	
200	4255.635	II
950	4275.11	I
300	4279.962	II
500	4292.470	II
400	4365.370	II
100	4444.831	II
400	4506.002	II
150	4516.049	II
150	4541.032	II
500	4555.920	II
100	4596.906	II
120	4649.271	II
2000	4651.12	I
120	4661.363	II
320	4671.702	II
300	4673.577	II
450	4681.994	II
100	4758.433	II
400	4812.948	II
120	4851.262	II
300	4854.988	II
100	4873.304	II
150	4901.427	II
1000	4909.734	II
500	4918.376	II
200	4926.424	II
900	4931.698	II
120	4943.026	II
700	4953.724	II
500	4985.506	II
400	5006.801	II
350	5009.851	II
400	5012.620	II
350	5021.279	II
200	5039.016	II
300	5047.348	II
900	5051.793	II
400	5058.910	II
500	5065.459	II
450	5067.094	II
350	5072.302	II
450	5088.277	II
420	5093.816	II
350	5100.067	II
1500	5105.54	I
250	5124.476	II
2000	5153.24	I
100	5158.093	II
100	5183.367	II
2500	5218.20	I
100	5269.991	II
100	5276.525	II
1650	5292.52	I
100	5368.383	II
1500	5700.24	I
1500	5782.13	I
150	5805.989	II
100	5833.515	II
200	5897.971	II
120	5937.577	II
400	5941.196	II
100	5993.260	II
650	6000.120	II
100	6023.264	II
250	6072.218	II
150	6080.343	II
150	6099.990	II
160	6107.412	II
300	6114.493	II

Cu I and II		
Intensity	Wavelength	
600	6150.384	II
750	6154.222	II
500	6172.037	II
550	6186.884	II
400	6188.676	II
300	6198.092	II
470	6204.261	II
450	6208.457	II
750	6216.939	II
700	6219.844	II
500	6261.848	II
1000	6273.349	II
350	6288.696	II
900	6301.009	II
550	6305.972	II
400	6312.492	II
120	6326.466	II
400	6373.268	II
750	6377.840	II
400	6403.384	II
850	6423.884	II
200	6442.965	II
750	6448.559	II
170	6466.246	II
950	6470.168	II
750	6481.437	II
400	6484.421	II
220	6517.317	II
400	6530.083	II
120	6551.286	II
200	6577.080	II
750	6624.292	II
800	6641.396	II
450	6660.962	II
100	6770.362	II
300	6806.216	II
400	6809.647	II
320	6823.202	II
250	6844.157	II
320	6868.791	II
270	6872.231	II
270	6879.404	II
220	6937.553	II
150	6952.871	II
150	6977.572	II
200	7022.860	II
300	7194.896	II
400	7326.008	II
300	7331.694	II
250	7382.277	II
1000	7404.354	II
270	7434.156	II
500	7562.015	II
700	7652.333	II
1000	7664.648	II
150	7681.788	II
450	7744.097	II
800	7778.738	II
750	7805.184	II
1500	7807.659	II
1000	7825.654	II
350	7860.577	II
300	7890.567	II
700	7902.553	II
1500	7933.13	I
400	7944.438	II
400	7972.033	II
1200	7988.163	II
2000	8092.63	I

Cu I and II		
Intensity	Wavelength	
500	8277.560	II
800	8283.160	II
250	8503.396	II
750	8511.061	II
200	8609.134	II
500	9813.213	II
250	9827.978	II
200	9830.798	II
600	9861.280	II
600	9864.137	II
200	9883.969	II
550	9916.419	II
500	9917.954	II
550	9925.594	II
450	9938.998	II
500	9960.354	II
450	10006.588	II
550	10022.969	II
550	10038.093	II
650	10054.938	II
450	10080.354	II

Cu III		
Ref. 295 - V.K.		
Vacuum		
75	542.90	III
200	615.67	III
150	616.03	III
150	687.98	III
150	715.53	III
125	730.38	III
250	788.07	III
250	788.46	III
250	791.36	III
150	801.14	III
100	829.34	III
40	1048.88	III
50	1186.80	III
50	1200.96	III
300	1219.30	III
200	1244.38	III
100	1279.14	III
200	1312.39	III
300	1332.97	III
200	1339.48	III
150	1363.08	III
300 r	1376.79	III
200 r	1377.49	III
150	1423.48	III
300 r	1481.23	III
200	1543.46	III
500 r	1593.75	III
1000 r	1642.21	III
300	1679.14	III
400	1702.10	III
500	1722.37	III
600	1741.37	III
200	1768.86	III
200	1840.91	III
100	1971.95	III
Air		
200	2013.22	III
150	2157.28	III
100	2299.47	III
500	2368.17	III
400	2391.74	III
800	2405.50	III
700	2412.34	III
2000	2444.44	III

Cu III

Intensity	Wavelength	
500	2468.41	III
1000	2482.36	III
700	2486.46	III
500	2508.49	III
500	2522.38	III
500	2538.66	III
400	2566.37	III
400	2573.33	III
500	2609.32	III
200	2643.92	III
200	2696.38	III
20	2751.33	III
100	2812.94	III
100	2978.87	III
75	3548.87	III
100	3639.42	III
500	3702.92	III
800	3744.70	III
400	3748.27	III
600	3752.06	III
1000	3776.97	III
800	3790.80	III
600	3804.13	III
600	3809.18	III
300	3881.68	III
150	3953.81	III
100	4090.49	III
200	4283.40	III
500	4351.97	III
1000	4352.80	III
500	4355.24	III
500	4370.84	III
500	4371.40	III
500	4373.43	III
1000	4377.11	III
200	4386.42	III
150	4927.41	III
400	5094.28	III
200	5168.97	III
400	5208.34	III
600	5219.21	III
200	5268.59	III
400	5317.78	III
300	5369.79	III
350	5418.48	III
250 d	5494.94	III
50	5573.94	III
100	5609.00	III
75	5702.12	III
100	5768.56	III
100	5850.72	III
200	5965.25	III
30	6100.87	III
50	6369.27	III
20	6512.54	III
20	6644.13	III
50	6793.20	III

Cu IV

Ref 199 - V.K.

Vacuum

30	360.86	IV
20	374.40	IV
30	405.24	IV
80	406.45	IV
40	413.45	IV
70	443.68	IV
80	451.16	IV
80	463.72	IV

Cu IV

Intensity	Wavelength	
80	484.53	IV
90	497.00	IV
90	504.60	IV
70	509.38	IV
40	519.51	IV
40	540.65	IV
60	550.92	IV
20	584.85	IV
60	1056.13	IV
30	1074.72	IV
50	1091.65	IV
30	1105.50	IV
25	1119.43	IV
40 p	1152.18	IV
60	1227.44	IV
70	1228.87	IV
70	1258.69	IV
90	1274.84	IV
90	1293.46	IV
90	1309.41	IV
70	1321.17	IV
100 d	1340.08	IV
100	1350.42	IV
100	1362.05	IV
100	1372.14	IV
100	1377.82	IV
100	1388.80	IV
90	1405.49	IV
90	1415.27	IV
90	1434.34	IV
90	1449.69	IV
80	1466.18	IV
70	1482.77	IV
80	1499.81	IV
90	1515.28	IV
90	1535.12	IV
80	1551.12	IV
90	1567.35	IV
80	1583.47	IV
70	1595.12	IV
80 p	1608.14	IV
90	1639.75	IV
20	1650.16	IV
70	1704.37	IV
30	1797.99	IV
70	1817.56	IV
70	1819.23	IV
60	1837.04	IV
80	1849.62	IV
30	1867.24	IV
30	1918.71	IV
40	1966.31	IV

Cu V

Ref. 324 - V.K.

Vacuum

9 h	258.95	V
49	271.33	V
49	283.97	V
22	293.41	V
56	299.64	V
65	305.83	V
51	312.51	V
66	321.05	V
74	326.57	V
82	333.56	V
81	339.88	V
81	346.00	V
86	355.41	V

Cu V

Intensity	Wavelength	
77	363.96	V
65	370.63	V
74	377.76	V
70	387.40	V
51	396.06	V
25	406.94	V
13	1097.10	V
42	1106.24	V
77	1113.22	V
67	1121.20	V
76	1128.80	V
59	1133.86	V
63	1142.38	V
54	1149.06	V
72	1157.54	V
64	1167.35	V
77	1176.53	V
84	1183.63	V
76	1192.54	V
83	1201.22	V
77	1204.90	V
71	1214.36	V
70	1221.34	V
76	1230.11	V
80	1239.73	V
79	1246.99	V
65	1253.07	V
70	1260.24	V
77	1269.35	V
78	1278.20	V
68	1286.13	V
67	1292.08	V
73	1299.22	V
65	1309.72	V
55	1318.89	V
65	1323.28	V
64	1329.22	V

CURIUM (Cm)

Z = 96

Cm I and II

Refs. 51,332 - J.G.C.

Air

10000	2462.76	II
10000	2617.17	II
10000	2636.28	II
10000	2651.17	II
10000	2653.80	II
10000	2725.68	II
10000	2736.89	II
10000	2748.04	II
10000	2784.83	II
10000	2811.62	II
10000	2824.20	II
10000	2833.58	II
10000	2899.90	II
10000	2912.97	II
10000	2928.92	II
10000	2996.18	II
10000	2999.39	I
10000 b	3014.87	II
10000	3044.85	II
10000	3109.69	I
10000	3116.41	I
10000	3137.16	I
10000	3147.33	I
10000	3155.10	I

Cm I and II

Intensity	Wavelength	
10000	3158.60	I
10000	3169.98	II
10000	3177.55	I
10000	3179.10	I
10000	3186.41	I
10000	3188.11	I
10000	3207.12	II
10000	3207.71	I
10000	3209.89	II
10000	3209.94	I
10000	3210.05	II
10000	3220.76	II
10000	3224.23	I
10000	3225.11	I
10000	3226.41	II
10000	3230.28	I
10000	3230.35	II
10000	3236.74	I
10000	3238.55	II
10000	3242.66	II
10000	3246.25	I
10000	3252.68	I
10000	3265.81	I
10000	3280.45	I
10000	3296.71	II
10000	3304.85	I
10000	3317.14	I
10000	3374.70	I
10000	3452.92	I
10000	3458.34	I
10000	3510.28	I
10000	3522.36	I
10000	3524.94	I
10000	3542.06	I
10000	3547.02	I
10000	3547.92	I
10000	3561.44	I
10000	3572.95	II
10000	3600.62	I
10000	3639.94	I
10000	3664.34	I
10000	3709.43	I
10000	3729.00	I
10000	3732.35	I
10000	3747.86	I
10000	3763.05	I
10000	3775.75	I
10000	3816.30	I
10000	3825.14	I
10000	3833.32	I
10000	3837.59	I
10000	3842.00	I
10000	3849.92	I
10000	3854.11	I
10000	3900.25	I
10000	3904.06	II
10000	3908.24	II
10000	3936.67	I
10000	3942.03	I
10000	3944.15	I
10000	3948.68	I
10000	3953.36	I
10000	3964.83	I
10000	3995.10	I
10000	4016.17	I
10000	4031.76	I
10000	4048.29	I
10000	4049.65	I
10000	4113.29	I

Cm I and II		
Intensity	Wavelength	
10000	4129.71	I
10000	4207.66	II
10000	4211.62	I
10000	4266.45	I
10000	4293.00	I
10000	4330.82	I
10000	4345.69	I
10000	4447.77	I
10000	4459.16	I
10000	4608.40	I
10000	5846.07	I
10000	5952.41	I
10000	6058.90	I
10000	6243.35	I
10000	6376.71	I
10000	6510.16	I
10000	6554.41	I
10000	6640.17	I
10000	6663.25	I
10000	6686.87	I
10000	6706.85	I
10000	6726.68	I
10000	6793.15	I
10000	7162.69	I
10000	7577.80	I
10000	7673.79	I
10000	7720.47	I
10000	8392.37	I
10000	9293.25	I
10000	9567.08	I
10000	9657.12	I
10000	10310.83	I
10000	10351.73	I
10000	10424.49	I
10000	10508.11	I
10000	10542.98	I
10000	10792.25	I
10000	10897.45	I
10000	11507.45	I
10000	11707.73	I
10000	11780.95	I
10000	11834.28	I
10000	12017.85	I
10000	12394.16	I
10000	12454.98	I
10000	12464.99	I
10000	13004.56	I
10000	13258.18	I
10000	13289.84	I
10000	13344.62	I
10000	13480.54	I
10000	13590.01	I
10000	13644.77	I
10000	13789.52	I
10000	13840.18	I
10000	13908.46	I
10000	13964.14	I
10000	14235.27	I
10000	14334.52	I
10000	14563.41	I
10000	14580.23	I
10000	15018.13	I
10000	15222.27	I
10000	15642.59	I
10000	15757.23	I
10000	15793.31	I
10000	16008.41	I
10000	17148.22	I
10000	17453.18	I

Cm I and II		
Intensity	Wavelength	
10000	17619.28	I
10000	18069.02	I
10000	19572.62	I
10000	19975.98	I
10000	20526.32	I
10000	20853.49	I
10000	20911.52	I
10000	20968.11	I
10000	21241.06	I
10000	21393.23	I

DYSPROSIUM (Dy)

Z = 66

Dy I and II Ref. 1 - C.H.C. Air		
260	2356.91	II
65	2381.95	
130	2387.36	II
150	2392.15	
180	2402.29	II
240	2410.01	II
150	2422.75	II
260	2439.84	II
90	2455.15	II
110	2459.99	II
90	2471.40	II
110	2480.93	II
170	2490.61	II
90	2510.31	II
170	2513.55	II
170	2517.61	II
130	2543.81	II
90	2545.12	II
150	2552.29	II
180	2557.94	II
90	2560.21	II
90	2566.25	II
220	2585.30	I
90	2591.56	II
75	2592.54	II
130	2600.16	II
130	2600.76	II
75	2608.69	II
370	2623.69	I
440	2634.80	II
110	2642.15	I
110	2645.35	II
110	2667.94	I
55	2676.84	II
50	2677.34	II
85	2689.31	II
85	2692.83	II
55	2709.01	II
55	2727.17	II
85	2729.50	II
55	2735.79	I
40	2739.30	II
85	2740.70	II
220	2755.75	II
55	2757.08	II
70	2766.50	II
70	2772.42	II
110	2772.61	II
40	2779.58	II
55	2791.44	II
120	2800.33	II

Dy I and II		
Intensity	Wavelength	
110	2800.53	II
110	2801.41	II
300	2816.39	II
140	2825.42	II
140	2862.70	I
190	2877.88	II
110	2884.28	II
120	2885.53	I
120	2890.74	II
120	2900.82	II
110	2904.62	II
190	2906.39	II
390	2913.95	II
110	2934.31	II
250	2934.52	II
110	2941.05	II
140	2944.56	II
150	2947.06	II
150	2947.21	II
250	2948.31	II
170	2950.33	II
110	2952.12	II
140	2953.70	II
220	2964.60	I
110	2977.42	II
110	2985.97	II
220	3015.68	II
390	3026.16	II
210	3029.81	II
610	3038.28	II
280	3043.13	II
210	3047.56	II
280	3060.64	II
390	3062.62	II
220	3066.99	II
330	3071.91	II
280	3073.54	II
220	3078.68	II
280	3101.93	II
220	3103.24	II
410	3109.76	II
330	3128.41	II
830	3135.38	II
360	3140.64	II
500	3141.14	II
220	3143.83	II
250	3146.16	II
1200	3156.52	II
670	3162.83	II
1000	3169.99	II
400	3177.89	II
220	3178.37	II
200	3184.79	II
330	3186.38	II
240	3187.68	II
330	3193.30	II
240	3206.40	II
220	3207.12	II
290	3208.85	II
470	3215.19	II
830	3216.63	II
240	3221.49	II
290	3223.28	II
240	3225.08	II
330	3225.95	II
490	3235.89	II
290	3236.69	II
490	3245.12	II
200	3248.36	II

Dy I and II		
Intensity	Wavelength	
1200	3251.27	II
200	3252.19	II
290	3256.26	II
200	3266.21	II
240	3269.11	II
200	3272.73	II
890	3280.09	II
490	3282.77	II
200	3287.94	II
200	3293.88	II
200	3296.30	II
200	3305.40	II
200	3305.51	II
240	3306.19	II
440	3308.79	II
1100	3308.88	II
510	3312.72	II
780	3316.32	II
240	3317.12	II
1000	3319.88	II
270	3326.19	II
780	3341.00	II
270	3341.88	II
200	3347.83	II
270	3352.69	II
510	3353.58	II
240	3359.46	II
510	3368.11	II
5300	3385.02	II
210	3386.57	II
610	3388.85	II
210	3391.96	II
3800	3393.57	II
1300	3396.16	II
380	3407.16	II
5300	3407.80	II
420	3408.14	II
1300	3413.78	II
530	3414.82	II
780	3419.63	II
530	3425.06	II
420	3429.44	II
1900	3434.37	II
330	3438.94	II
560	3440.93	II
1300	3441.45	II
3800	3445.57	II
830	3446.99	II
440	3449.89	II
2700	3454.32	II
440	3454.51	II
1300	3456.56	II
4400	3460.97	II
720	3468.43	II
560	3471.14	II
560 d	3471.53	II
380	3473.70	II
1300	3477.07	II
4400	3494.49	II
560	3496.34	II
400	3497.81	II
830	3498.71	II
400	3501.50	II
830	3504.53	II
830	3505.45	II
1300	3506.81	II
560	3517.26	II
4400	3523.98	II
22000	3531.70	II

Dy I and II			Dy I and II			Dy I and II			Dy I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
4400	3534.96	II	1200	3747.82	II	540	4011.29	II	100	4541.66	II
5500	3536.02	II	1400	3753.51	II	540	4013.82	I	140	4565.09	I
4400	3538.52	II	1400	3753.75	II	540	4014.70	II	420	4577.78	I
400	3539.37	II	1200	3757.05	I	370	4023.71	I	2100	4589.36	I
1700	3542.33	II	4700	3757.37	II	420	4027.78	II	990	4612.26	I
400	3544.20	II	640	3767.63	I	520 d	4028.32	II	50	4613.83	I
400	3544.35	II	330	3771.11	I	520	4032.47	II	50	4614.82	I
1400	3546.83	II	640	3773.05	I	420	4033.65	II	60	4617.26	II
330	3548.19	II	370	3774.71	I	420	4036.32	II	140	4620.03	II
4400	3550.22	II	420	3781.47	I	320	4041.98	II	50	4662.72	I
2200	3551.62	II	330	3785.41	II	12000	4045.97	I	110	4664.66	II
440 h	3558.23	II	3300	3786.18	II	1600	4050.56	II	85	4673.60	II
440	3559.30	II	1600	3788.44	II	520	4055.14	II	50	4682.03	II
2200	3563.15	II	700	3791.87	II	2500	4073.12	II	50	4689.75	II
560	3563.69	II	510	3804.14	II	7400	4077.96	II	95	4698.68	II
780	3573.83	II	580	3806.27	II	370	4085.34	I	85	4721.22	I
1400	3574.15	II	470	3812.27	I	390	4096.10	I	70	4727.13	II
4400	3576.24	II	470	3813.67	II	3900	4103.30	II	170	4731.84	II
1700	3576.87	II	1400	3816.76	II	860	4103.87	I	40	4745.73	II
830	3577.98	II	700	3825.68	II	1500	4111.34	II	60	4754.99	II
440	3580.04	II	2300	3836.50	II	490	4124.63	II	50	4760.04	II
400	3584.42	II	370	3840.89	I	390	4128.24	II	60	4771.94	I
3300	3585.06	II	1400	3841.31	II	350	4129.12	I	50	4774.80	I
1400	3585.78	II	330	3842.00	II	990	4129.42	II	120 h	4775.79	I
560	3586.11	II	330	3844.36	I	350	4130.35	I	75	4786.92	II
360	3590.07	II	420	3846.34	II	390	4133.85	I	95	4791.29	I
1100	3591.41	II	420	3847.02	I	470	4141.50	II	29	4800.64	I
560	3591.81	II	330	3849.39	II	1200	4143.10	II	50	4807.94	I
560	3592.11	II	1200	3853.03	II	990	4146.06	I	40	4810.28	I
1800	3595.04	II	420	3858.40	I	5700	4167.97	I	50	4812.80	I
400	3596.06	II	370	3866.58	II	370	4171.93	I	75	4819.04	I
560	3600.38	II	560	3868.45	II	930	4183.72	I	85	4824.96	I
360	3602.82	II	1600	3868.81	I	12000	4186.82	I	75	4828.88	I
1800	3606.12	II	300	3869.42	II	320	4190.94	I	50	4829.68	II
440	3618.51	II	820	3869.86	II	2200	4191.64	I	70	4832.38	I
560	3620.16	II	7000	3872.11	II	6800	4194.84	I	35	4833.75	II
470	3624.27	II	1200	3873.99	II	320	4195.19	II	75	4841.75	I
1100	3629.42	II	470	3879.11	II	800	4198.02	I	40	4856.24	II
4000	3630.24	II	300	3881.99	II	680	4201.30	I	40	4868.05	II
440	3632.78	II	5800	3898.53	II	680	4202.24	I	40	4875.93	I
400	3635.27	II	540	3914.87	II	230	4205.06	I	85	4880.16	I
360	3637.28	II	540	3915.59	II	370	4206.54	II	40	4884.55	I
1100	3640.25	II	540 d	3917.29	I	440	4211.24	I	95	4888.08	I
400	3643.92	II	320	3923.38	II	16000	4211.72	I	40	4889.33	II
11000	3645.40	II	420	3927.86	I	1800	4213.18	I	75	4890.10	II
360	3645.86	II	540	3930.14	I	3700	4215.16	I	50	4893.68	I
1000	3648.78	II	2100	3931.52	II	4400	4218.09	I	24	4899.24	I
700	3664.62	II	320	3932.22	II	4400	4221.11	I	55	4916.41	I
400	3666.84	I	370	3933.00	II	540	4222.21	I	50	4922.22	II
990	3672.30	II	320	3934.21	II	2700	4225.16	I	65	4923.16	II
420	3672.70	II	420	3936.70	I	680	4232.02	I	480	4957.34	II
400	3673.14	II	540	3942.53	II	680	4239.85	I	24	4959.59	I
1400	3674.08	II	10000	3944.68	II	440	4245.91	I	28	4973.57	I
2200	3676.59	II	420	3946.93	II	440	4256.33	II	40	4985.52	I
640	3678.51	I	540	3950.39	II	250	4276.69	I	50	5003.87	I
820	3684.85	I	420	3954.55	II	370 d	4294.93	II	55	5004.28	II
1300	3685.78	I	800	3957.79	II		4295.04	I	24	5010.60	I
4700	3694.81	II	370	3962.59	I	1000	4308.63	II	24	5017.98	II
370	3697.31	II	320	3967.51	I	320	4325.86	I	70	5022.12	I
990	3698.21	II	14000	3968.39	II	200	4358.44	II	30	5024.03	I
540	3701.63	II	2700	3978.57	II	320	4374.24	II	24	5024.54	I
330	3707.40	II	1400	3981.92	II	320	4374.76	II	40	5027.87	I
440	3707.57	II	1600	3983.65	II	540	4409.38	II	50	5033.00	I
440	3708.22	II	800	3984.21	II	150	4444.58	I	160	5042.63	I
420	3710.07	II	540	3991.32	II	740	4449.70	II	24	5047.25	I
330	3711.66	II	1600	3996.69	II	110	4455.60	II	50 h	5050.21	I
1600	3724.45	II	8000	4000.45	II	250	4468.14	II	30	5053.35	I
300	3728.00	I	420	4005.84	I	100 d	4527.58	I	24	5055.46	I
930	3739.34	I	320	4006.07	I		4527.76	II	95	5070.68	I

Dy I and II			Dy I and II			Dy I and II			Er I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
										Ref. 1 - C.H.C.	
										Air	
120	5077.67	I	24 h	5738.73	DyO	11	6951.42	I	110	2358.51	II
80	5090.38	II	50	5740.20	I	40	6958.08	I	100	2386.58	II
80	5110.32	I	55	5745.53	I	13 h	6982.44	I	120	2387.17	II
130 h	5120.04	I	24	5750.48	I	13	6991.30	I	110	2396.38	III
30	5135.02	I	24	5758.79	I	45	6998.10	I	140	2446.39	II
190	5139.60	II	80 h	5832.01	DyO	20	7017.42	I	100	2537.02	II
40	5161.03	II	55 h	5833.85	DyO	35	7055.95	II	110	2547.28	II
40	5164.12	II	40 h	5834.86	DyO	24	7075.14	II	290	2586.73	II
50	5165.34	I	28 h	5844.41	DyO	17	7109.26	II	110	2587.04	II
110	5169.69	II	24	5845.65	DyO	11	7120.81	II	130	2592.57	II
20	5172.90	II	40 h	5848.05	DyO	13	7175.11	II	120	2595.03	II
80	5185.30	I	40	5855.56	DyO	11	7213.27	I	140	2624.18	II
40	5188.45	II	55 h	5868.11	II	17 h	7230.04	I	490	2670.26	II
290	5192.86	II	40	5915.16	II	13	7250.01	I	330	2672.25	II
95	5197.66	II	20	5924.56	II	17	7345.13	II	100	2675.35	II
50	5246.94	II	70	5945.80	I	11	7370.23	II	270	2739.31	II
70	5259.88	I	50 l	5964.46	I	20	7376.04	I	310	2750.19	II
130	5260.56	I	120	5974.49	I	11	7407.59	I	230	2755.01	II
55bl	5263.3	DyO	24	5984.86	I	24	7412.37	I	610	2755.63	II
65	5267.11	I	140	5988.56	I	55	7426.86	II	510	2770.02	II
50	5272.25	II	24 h	6005.75	DyO	20	7457.05	II	230	2778.97	II
50	5275.29	II	24 h	6006.54	DyO	17	7516.61	II	230	2802.53	II
50	5279.70	II	24 h	6006.97	DyO	55	7543.73	I	310	2804.35	II
55	5282.07	I	30	6008.94	I	17 h	7553.00	I	410	2820.19	II
28	5284.99	II	65	6010.82	I	27	7559.78	I	270 d	2833.91	II
40	5297.82	II	24	6017.26	I	40	7562.96	II	390	2838.71	II
160	5301.58	I	24	6030.98	I	20 h	7577.46	II	270	2848.37	II
40	5309.02	II	24bl	6042.49	DyO	27 h	7591.30	I	250	2855.41	II
50	5324.69	I	24	6058.18	I	13 h	7611.55	I	310	2859.84	II
24	5337.43	II	30	6085.06	I	11 h	7617.70	I	310	2896.96	II
65	5340.30	I	140	6088.26	I	35 h	7641.09	I	390	2897.52	II
30	5352.11	I	24	6127.15	I	17	7645.86	I	1000	2904.47	II
30	5368.20	II	24	6133.64	I	13	7646.64	I	210	2909.58	II
20	5385.63	II	24	6158.28	I	80	7662.36	I	1500	2910.36	II
85	5389.58	II	100	6168.43	I	11	7666.78	II	270	2915.62	II
40	5395.57	I	20	6196.23	II	35	7715.33	I	350	2929.27	II
20 h	5398.26	DyO	270	6259.09	I	45	7729.76	II	270	2945.28	II
24	5399.93	II	30	6260.36	I	20	7751.62	II	230	2946.62	II
50	5404.19	I	14	6343.32	I	35	7812.06	I	1500	2964.52	II
80	5419.13	I	40	6386.80	I	27	7909.38	I	410	2968.76	II
70	5423.32	I	24	6396.60	II	11	7968.63	I	210	2974.47	II
30	5424.27	I	50	6421.92	I	12	7982.85	II	230	2975.68	II
40	5426.70	II	13 h	6436.55	I	13	8147.29	I	270	2983.80	II
30	5443.34	II	8	6460.83	I	27	8198.77	II	1200	3002.41	II
95	5451.11	I	10	6468.58	II	100	8201.57	II	310	3002.65	II
30	5455.47	II	11	6474.91	I	11	8218.62	II	230	3012.47	II
24	5469.10	II	20	6483.59	II	20	8265.53	I	230	3016.84	II
28	5496.83	I	28	6486.59	I	35	8326.10	I	290	3025.95	II
24	5502.79	I	20	6558.02	I	35	8392.01	II	270	3028.27	II
28	5506.52	I	160	6579.37	I	12	8405.85	II	370	3031.31	II
24	5515.41	II	14	6594.14	II	20	8416.64	II	310	3036.22	II
30	5528.01	I	15	6643.37	I	24	8438.58	II	210	3054.42	II
65	5547.27	I	22	6658.36	I	11	8630.12	I	230	3066.22	II
40 d	5600.65	II	29	6661.64	I	27	8655.94	II	450	3070.74	II
24	5605.53	I	75	6667.86	I	17	8657.68	II	560	3072.53	II
30	5613.23	I	10	6700.64	II	17	8678.49	II	610	3073.34	II
20	5627.49	I	29	6747.93	I	11	8696.83	II	210	3078.87	II
100	5639.50	I	10	6757.62	I	11 h	8715.95	II	720	3082.08	II
55 h	5645.99	I	45	6765.89	I	20	8750.40	II	610	3084.02	II
80	5652.01	I	12	6818.20	I	12	8780.83	I	370	3099.19	II
24	5685.58	I	180	6835.42	I	45	8791.39	II	230	3106.78	II
28 h	5693.67	DyO	80	6852.96	I	13	8833.08	II	310 d	3113.43	II
24 h	5694.10	DyO	22	6856.46	I	24	8850.37	II		3113.54	II
28cw	5694.54	DyO	22	6888.83	I				770	3122.72	II
28	5698.72	II	15	6897.97	II		**ERBIUM (Er)**		290	3132.52	II
24	5702.91	I	65	6899.32	II				470	3132.77	II
70 h	5718.46	I	22	6906.53	II		**Z = 68**		410	3141.10	II
28 h	5725.84	DyO	15	6929.55	I						
55 h	5728.64	DyO	29	6950.28	II		Er I and II				

Er I and II			Er I and II			Er I and II			Er I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
	3141.15	II	390	3518.18	II	810	3902.76	II	110	4369.39	II
250	3144.33	II	610	3524.91	II	250	3903.98	I	160	4382.17	I
410	3154.29	II	410	3539.59	I	250	3904.56	II	300	4384.70	II
870	3181.92	II	310	3548.26	II	1200	3905.40	I	300	4386.40	I
410	3183.42	II	820	3549.84	II	11000	3906.31	II	100	4403.17	II
250	3185.25	II	310	3553.20	II	280	3918.05	I	810	4409.34	I
310	3200.58	II	1500	3558.02	I	210	3918.35	II	180	4418.70	I
230	3205.15	II	510	3558.71	I	280	3921.88	II	570	4419.61	II
270	3214.44	II	1000	3559.90	II	810	3932.25	II	110	4422.51	II
870	3220.73	II	310	3565.17	I	3200	3937.01	I	320	4424.57	I
610	3223.31	II	920	3570.75	II	2100	3938.63	II	370	4426.77	I
210	3227.16	II	310	3578.24	I	3200	3944.42	I	110	4437.66	I
2300	3230.58	II	1000	3580.52	II	550	3948.06	I	100	4459.24	II
250	3232.03	II	370	3586.60	I	250	3951.48	I	100	4473.50	II
330	3237.98	II	610	3590.76	I	320	3956.42	I	130	4496.39	I
330	3249.34	II	410	3595.84	I	280	3966.35	I	200	4500.75	II
560	3259.05	II	610	3599.50	II	2700	3973.04	I	130	4522.74	I
	3259.11	II	1000	3599.83	II	3200	3973.58	I	160	4563.26	II
2700	3264.78	II	510	3604.90	II	1400	3974.72	II	1000	4606.61	I
430	3267.10	II	410	3607.42	I	280	3976.73	I	160	4630.88	II
	3267.18	II	3100	3616.56	II	810	3977.02	I	110	4640.60	II
330	3269.41	II	510	3617.85	II	1100	3982.33	I	110	4665.44	II
250	3278.22	II	510	3618.92	II	280	3987.53	I	310	4673.16	I
720	3279.33	II	720	3628.04	I	810	3987.66	I	570	4675.62	II
720	3280.22	II	310	3629.37	I	230	3991.15	I	150	4679.06	II
470	3286.77	II	1000	3633.54	II	230	4004.05	I	230	4722.69	I
330 d	3303.88	II	510	3634.67	I	14000	4007.96	I	150	4729.05	I
	3303.95	II	1600	3638.68	I	230	4008.18	II	130	4751.52	II
370	3305.56	II	900	3645.94	II	280	4009.16	II	170	4759.65	II
2300	3312.42	II	520	3650.41	II	1100	4012.58	I	190	4820.35	II
560	3316.39	II	360	3652.58	II	350	4015.57	II	140	4857.44	I
770	3323.19	II	500	3652.87	II	3000	4020.51	I	150	4872.09	II
290	3329.66	II	360	3664.45	I	450	4021.55	I	210	4900.08	II
770	3332.70	II	470	3669.02	II	230	4043.01	II	210	4934.11	II
370	3337.25	II	500	3682.70	II	1000	4046.96	I	130	4944.36	I
290	3337.79	II	320	3684.01	I	280	4048.34	II	180	4951.74	II
250	3340.03	II	380	3684.28	II	200	4049.49	II	130	4976.42	I
290	3341.84	II	7900	3692.65	II	940	4055.47	II	250	5007.25	I
1300	3346.04	II	450	3696.25	II	550	4059.51	I	140	5028.33	I
470	3350.06	II	380	3697.68	I	690	4059.78	II	120	5028.91	II
350	3350.26	II	540	3700.72	II	420	4077.88	I	200	5035.94	I
1400	3364.08	II	520	3707.64	II	550	4081.24	II	210	5042.05	II
1400 d	3368.02	II	520	3712.39	II	3500	4087.63	I	130	5043.86	I
	3368.13	I	320	3719.35	I	210	4092.90	I	130	5044.89	I
450	3370.55	II	1300	3729.52	II	1100	4098.10	I	130	5077.59	II
7700	3372.71	II	450	3731.26	II	350	4100.56	II	120	5124.56	I
970	3374.17	II	540	3738.16	II	320	4116.36	I	130	5127.41	II
290	3381.32	II	340	3741.10	II	320	4118.55	I	120	5131.53	I
230	3382.06	I	900	3742.64	II	600	4131.50	I	130	5133.83	II
1700	3385.08	II	900	3747.43	I	550	4142.91	II	170	5164.77	II
450	3389.74	II	540	3756.05	I	6900	4151.11	I	130	5172.78	I
2300	3392.00	II	410	3781.01	II	280	4189.98	II	160	5188.90	II
350	3396.07	II	1800	3786.84	II	1000	4190.70	I	150	5206.52	I
290	3396.84	II	560	3787.86	II	130	4205.32	I	60	5212.91	II
390	3401.83	II	560	3791.83	II	1400	4218.43	I	30	5215.13	II
350	3417.63	II	500	3792.79	I	200	4220.99	I	30	5218.26	II
490	3428.39	II	560	3797.06	II	320	4230.20	II	45	5229.34	II
770	3441.13	II	1600	3810.33	I	140	4234.78	II	140	5255.93	II
390	3442.68	I	3600	3830.48	II	200	4251.94	II	22	5256.47	II
490	3469.51	I	540	3849.91	I	140	4276.48	II	27	5257.02	II
970	3471.71	II	320	3851.60	II	690	4286.56	I	35	5264.77	II
610	3479.41	II	680	3855.90	I	320	4298.91	I	80	5272.91	I
970	3485.85	II	540	3858.39	II	320	4301.60	II	55	5277.71	I
350	3486.82	II	7500	3862.85	I	140	4303.81	II	27	5279.34	II
350	3496.86	II	1500	3880.61	II	110	4319.94	II	45	5302.30	II
6700	3499.10	II	1200	3882.89	II	130	4328.81	I	55	5333.06	I
610	3502.78	I	400	3890.61	II	110	4331.36	I	27	5333.33	II
390	3508.38	II	4200	3892.68	I	140	4340.92	I	27	5334.23	II
490	3514.89	II	5200	3896.23	II	190	4348.34	I	22	5343.94	II

Er I and II			Er I and II			Er I and II			Er III		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
30	5344.50	II	22	6032.12	II	22	7659.25	I	200	2419.81	III
90	5348.06	I	22	6045.63	II	4	7665.64	I	200	2422.47	III
45	5350.47	I	22	6048.14	II	35	7680.01	I	40	2431.51	III
35	5368.85	I	45	6054.85	I	9	7722.14	I	60	2464.60	III
35	5395.87	II	70	6061.25	I	8	7726.19	II	2	2492.04	III
60	5414.63	II	60	6076.45	II	11 h	7747.44	I	100	2508.59	III
18	5422.81	II	35	6116.01	I	22	7754.63	I	2	2531.03	III
18 h	5451.30	I	35	6125.32	I	4	7762.16	I	100	2532.36	III
35	5454.27	II	30	6170.06	II	9	7796.69	I	8	2536.76	III
180	5456.62	I	27	6183.21	II	35	7797.47	I	80	2540.91	III
35	5462.43	II	360	6221.02	I	9	7838.80	I	3	2543.31	III
90	5468.32	I	35	6230.90	I	11	7844.00	I	10	2545.95	III
18	5477.47	II	55	6262.56	I	16	7847.55	I	50	2557.22	III
80	5485.97	II	45	6267.93	I	5	7875.36	I	80	2570.74	III
27	5497.44	II	60	6268.87	I	5	7879.36	I	40	2580.02	III
27	5516.02	I	35	6274.94	I	18	7899.55	I	2	2589.55	III
80	5593.46	I	30	6286.86	I	8	7913.08	I	80	2590.72	III
45 d	5601.14	I	45	6299.42	I	35	7921.85	I	20	2591.56	III
	5601.32	I	130	6308.77	I	30	7937.84	I	200	2591.83	III
45 h	5609.94	I	55	6326.13	I	8	7952.93	I	20	2598.39	III
60	5611.82	I	22	6347.16	II	12	7964.51	I	3	2599.18	III
70	5622.01	I	45	6388.19	I	8	7979.03	II	100	2603.62	III
80	5626.53	II	22	6432.53	I	8	7980.87	I	40	2604.91	III
30	5636.20	I	27	6485.87	I	5	8023.03	I	25	2614.53	III
90	5640.36	I	55	6492.35	I	12	8035.91	I	30	2617.64	III
22	5641.42	I	22	6541.57	I	12	8181.85	I	2	2618.40	III
22 h	5658.63	II	60	6583.48	I	35	8312.82	I	2	2618.94	III
70	5664.95	I	70	6601.11	I	18	8328.57	II	8	2625.19	III
45	5665.44	II	27	6721.91	I	5	8367.58	II	20	2626.37	III
55	5675.48	I	70	6759.87	I	55	8409.90	I	4	2637.52	III
14	5695.53	II	22	6762.92	I	11	8466.18	II	200	2637.77	III
27	5710.87	II	27	6773.37	I	35	8472.42	I	5	2651.49	III
55	5717.48	I	35	6790.92	I	14	8517.71	II	25	2683.10	III
70	5719.55	I	22	6825.44	I	18	8521.37	II	400	2723.29	III
55	5726.97	I	22	6825.98	I	22	8768.64	I	100	2738.53	III
22	5733.43	II	70	6848.10	I	11 h	8776.63	II	500	2739.27	III
22	5736.56	I	55	6865.13	I	9	8866.84	II	8	2741.41	III
22	5736.94	I	27	6879.98	I				80	2746.03	III
100	5739.19	I	22	7001.40	I		Er III		6	2752.20	III
35	5740.61	I	12	7058.55	I		Ref. 301 – J.R.		80	2756.20	III
60	5748.65	I	12 h	7065.04	I		Air		400	2759.23	III
55	5752.53	I	11	7070.99	II	2	2165.26	III	150	2761.92	III
70	5757.63	II	18	7101.27	I	3	2190.77	III	60	2762.66	III
290	5762.80	I	8	7109.67	I	10	2198.15	III	15	2767.11	III
70	5769.92	I	11	7155.40	II	1	2223.98	III	100	2768.72	III
45	5782.82	I	5	7161.91	I	4	2232.35	III	60	2772.07	III
70	5784.66	I	14 h	7197.00	I	60	2235.28	III	60	2774.80	III
22	5791.15	II	7 h	7264.82	II	8	2245.60	III	20	2775.55	III
70	5800.79	I	7 h	7283.95	I	2	2255.95	III	2	2780.60	III
22	5806.10	I	14	7329.73	II	80	2269.36	III	80	2783.11	III
430	5826.79	I	18	7355.37	I	600	2277.65	III	500	2792.54	III
45	5835.84	I	11	7356.34	I	100	2309.19	III	10	2804.10	III
100	5850.07	I	18	7428.67	I	40	2358.69	III	100	2805.87	III
120	5855.31	I	55	7459.55	I	10	2358.79	III	6	2808.44	III
140	5872.35	I	9	7460.42	I	50	2359.33	III	50	2824.75	III
120	5881.14	I	120	7469.51	I	200	2367.64	III	150	2830.34	III
27	5886.30	II	22	7532.34	I	20	2375.50	III	1	2831.95	III
27	5902.08	II	6 h	7539.18	I	10	2377.07	III	8	2833.03	III
55	5906.06	I	27	7556.26	I	80	2381.25	III	8	2845.29	III
45	5909.24	I	6 h	7574.21	I	20	2381.40	III	60	2846.08	III
35	5933.50	I	5 h	7590.51	I	40	2381.75	III	6	2849.63	III
22	5946.37	I	11	7597.33	I	6	2391.96	III	1	2869.52	III
55	5968.68	I	6	7607.23	I	60	2393.08	III	8	2878.24	III
27	5975.49	I	11	7613.52	I	5	2393.60	III	1	2955.93	III
35	6006.79	II	6	7623.48	I	250	2396.40	III	1	2958.63	III
22	6008.75	II	16 h	7645.67	I	10	2398.91	III	1000	3055.10	III
55	6014.83	I	8	7650.63	I	2	2402.75	III	1000	3070.40	III
35	6015.74	II	22	7654.45	II	80	2404.58	III	500	3100.40	III
70	6022.56	I	12 h	7658.05	I	100	2410.47	III	1500	3166.25	III

Er III

Intensity	Wavelength	
3	3172.47	III
1	3173.45	III
50	3175.74	III
400	3214.95	III
2000	3301.23	III
8	3341.00	III
200	3480.54	III
8	3592.96	III
600	3715.67	III
200	3739.43	III
4000	3816.78	III
600	3962.87	III
40	4009.70	III
2	4088.58	III
1000	4288.18	III
40000	4290.06	III
300	4338.24	III
20000	4386.86	III
30	4612.93	III
15000	4735.56	III
2000	4783.12	III
8	4876.07	III
8000	5903.30	III

EUROPIUM (Eu)

Z = 63

Eu I and II
Ref. 1 – C.H.C.
Air

21	2499.39	II
26	2554.78	II
26	2559.18	II
160	2564.17	II
110	2568.17	II
26	2574.76	II
230	2577.14	II
26	2581.86	II
26	2604.61	I
30	2635.50	II
1000	2638.77	II
380	2641.27	II
40	2653.61	II
640	2668.34	II
110	2673.42	II
250	2678.29	II
250	2685.66	II
550	2692.03	II
700	2701.14	II
800	2701.90	II
240	2705.28	II
180	2709.99	I
700	2716.98	II
70	2723.96	I
4200	2727.78	II
190	2729.33	II
380	2729.44	II
50	2731.37	I
40	2732.61	I
80	2735.25	I
160	2740.62	II
70	2743.28	I
120	2744.26	II
40	2745.61	I
70	2747.29	II
80	2747.83	I
90	2752.17	II
480	2781.89	II

Eu I and II

Intensity	Wavelength	
1900	2802.84	II
220	2811.75	II
30	2813.08	II
3400	2813.94	II
550	2816.18	II
2000	2820.78	II
400cw	2828.72	II
120	2829.30	II
140	2833.26	II
80	2843.96	II
60	2852.05	II
260	2859.67	II
280	2862.57	II
25	2864.42	II
60	2876.06	II
100	2878.87	I
80	2887.85	II
200	2892.54	I
140	2893.03	I
360	2893.83	I
3200	2906.68	II
160	2908.99	I
30	2917.44	II
850	2925.04	II
60	2947.29	II
200cw	2952.68	II
30	2958.91	I
35	2959.47	II
260	2960.21	II
300	2991.33	II
35	2995.22	II
40	3006.26	II
35	3022.15	I
30	3040.77	II
320cw	3054.94	II
120	3058.98	I
35	3069.11	II
35	3076.07	II
220	3077.36	II
35	3089.35	II
120	3097.45	II
320	3106.18	I
950	3111.43	I
120	3130.73	II
40	3132.16	I
45	3149.88	II
85	3173.61	II
40	3185.54	I
420	3210.57	I
1000	3212.81	I
420	3213.75	I
45	3235.13	I
95	3241.40	I
45	3246.03	I
45	3247.32	II
100	3247.55	I
100	3266.39	II
150	3272.77	II
210	3277.78	II
150	3301.95	II
45	3304.50	II
140	3308.02	II
140	3313.33	II
65	3319.89	II
95	3321.86	II
85	3322.26	I
950	3334.33	I
45	3338.75	II
110	3350.40	I

Eu I and II

Intensity	Wavelength	
40	3351.56	II
40	3354.38	II
45	3367.64	II
140	3369.06	II
65	3380.25	II
75	3390.78	II
190	3391.99	II
280	3396.58	II
45	3419.84	II
65	3423.09	II
150	3425.02	II
45	3426.44	II
45	3435.05	II
65	3435.20	II
40	3435.72	II
45	3440.82	II
150	3441.00	II
45	3445.18	II
85	3457.05	I
45	3457.56	II
130	3461.38	II
85	3467.88	I
75	3477.07	I
75 h	3505.30	II
470cw	3521.09	II
75	3531.15	II
45	3532.23	II
65	3538.08	II
150	3542.15	II
85	3543.85	II
45	3549.71	II
180	3552.52	II
75	3589.27	I
45	3591.31	II
150	3603.20	II
75	3611.57	II
45	3616.15	II
95	3622.54	II
95	3632.18	II
45	3673.19	II
45	3674.63	II
45	3678.26	II
6400	3688.42	II
60	3710.87	II
95	3713.45	II
95	3714.90	II
35	3716.94	II
35	3717.69	II
40	3719.16	I
20000cw	3724.94	II
45	3729.68	II
45	3729.74	II
21	3732.20	I
45	3738.08	II
350	3741.31	II
100	3743.56	II
260	3761.12	II
95	3765.93	II
40	3774.10	I
60	3781.40	II
40	3788.76	II
45	3791.50	II
130	3799.01	II
70	3801.36	
95	3807.54	II
120	3811.33	I
120	3815.50	II
39000cw	3819.67	II
120	3826.68	II

Eu I and II

Intensity	Wavelength	
140	3844.23	II
190	3865.57	I
45	3872.72	I
70	3877.27	II
150	3884.75	I
23	3896.78	I
23	3900.18	I
70	3900.51	I
28000cw	3907.10	II
45	3915.24	II
45	3916.00	I
230	3917.29	I
23	3917.70	II
40	3918.52	I
100	3919.09	II
40	3928.87	II
32000cw	3930.48	II
55	3941.56	II
30 h	3942.21	II
60	3942.94	II
120	3943.08	II
30	3944.59	II
30	3945.67	II
30	3949.13	II
60	3949.60	I
45	3950.76	II
55	3951.33	II
60	3955.75	I
40	3957.92	II
30	3963.61	I
120	3964.90	II
150	3966.59	II
45	3967.18	I
30000cw	3971.96	II
60	3978.42	I
30	3979.63	II
55 h	3986.60	I
40	3988.24	II
30	3993.93	II
55	3995.98	II
60	4003.71	II
180	4011.69	II
150	4017.58	II
120	4039.19	I
45 h	4078.24	I
120	4085.38	II
75	4096.80	II
60	4106.88	I
90 h	4112.04	II
45	4119.30	II
75	4127.28	I
33000cw	4129.70	II
30	4136.59	II
40	4137.07	I
30	4141.02	II
60	4141.72	II
30	4151.52	II
45	4151.64	II
30	4157.72	I
110	4172.80	II
30	4175.16	II
110	4182.22	I
40	4195.36	II
40	4196.18	II
60000cw	4205.05	II
45	4221.08	II
40	4223.88	II
90 h	4227.40	II
75	4229.33	II

Eu I and II			Eu I and II			Eu I and II			Eu I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
75	4232.45	II	120	5239.24	I	12	5909.94	I	60	6519.59	I
90	4237.51	II	200	5266.40	I	75	5915.74	I	15	6522.72	I
45	4238.69	II	390	5271.96	I	12	5925.30	I	8 h	6549.12	I
45	4244.74	I	110	5272.48	I	27	5926.52	I	75	6567.87	I
45	4247.06	II	150	5282.82	I	45	5942.72	I	45	6593.79	I
45	4253.80	II	55	5287.25	I	27	5953.49	I	18 h	6603.55	I
30	4270.24	II	60	5289.25	I	27	5953.84	II	1400	6645.11	II
150	4298.73	I	120	5291.26	I	30	5954.28	I	26	6685.21	I
90	4329.36	I	60	5293.68	I	90	5963.76	I	95	6693.96	I
75	4329.97	I	120	5294.64	I	330	5966.07	II	7 h	6701.06	I
60	4330.61	II	90	5303.85	I	480cw	5967.10	I	12 h	6710.45	I
40	4331.18	I	30 h	5350.41	I	15 h	5968.43	I	30	6744.88	I
90	4337.68	I	75 h	5351.69	I	30	5971.69	I	30 h	6782.54	I
240	4355.09	II	40	5352.84	I	170	5972.75	I	14 h	6787.48	I
27	4361.57	II	90	5355.10	I	15	5980.47	I	140	6802.72	I
55	4369.47	II	540	5357.61	I	27	5983.14	I	35	6816.06	I
45 h	4372.20	II	60	5360.83	I	27	5983.78	I	11 h	6834.30	I
75	4383.17	II	120	5361.61	I	240	5992.83	I	17	6840.93	I
90	4387.88	I	110	5376.94	I	60	6004.36	I	17 h	6844.83	I
21 h	4405.27	II	120	5392.94	I	15 h	6005.61	I	14 h	6847.04	I
55	4407.07	II	450	5402.77	I	60 h	6012.20	I	360	6864.54	I
18	4419.66	II	45	5405.33	I	110	6012.56	I	21	6898.21	I
120	4434.81	II	45	5411.86	I	60	6015.58	I	60 h	6903.67	I
14000cw	4435.56	II	55	5421.07	I	420	6018.15	I	14 h	6910.17	I
75 h	4464.97	II	90	5426.94	I	60	6023.15	I	30 h	6914.82	I
24	4485.15	II	40	5443.56	I	170	6029.00	I	120	7040.20	I
3000	4522.57	II	380	5451.51	I	60	6044.66	I	12	7074.54	I
45 h	4535.59	I	260	5452.94	I	420	6049.51	II	330	7077.10	II
11000	4594.03	I	40	5457.62	I	140	6057.36	I	100	7106.48	I
21	4602.63	I	90	5472.32	I	90	6075.58	I	6	7164.66	I
9800	4627.22	I	120	5488.65	I	30	6077.38	I	30	7175.55	I
8300	4661.88	I	45	5495.20	I	240	6083.84	I	570	7194.81	II
30	4713.59	I	15	5500.83	I	240	6099.35	I	570	7217.55	II
27	4740.50	I	120	5510.52	I	60	6108.15	I	11 h	7224.68	I
45	4792.59	I	30	5526.63	I	120	6118.78	I	15	7258.72	I
40 h	4829.30	I	30	5533.25	I	60	6124.67	I	30	7262.77	I
60	4830.33	I	30	5542.54	I	330	6173.05	II	11 h	7281.53	I
40 h	4840.47	I	200	5547.44	I	110	6178.76	I	6 h	7297.56	I
60 h	4849.64	I	150	5570.33	I	260cw	6188.13	I	540	7301.17	II
110	4867.62	I	200	5577.14	I	140	6195.07	I	11	7310.46	I
40 h	4884.05	I	75	5579.63	I	15 h	6207.60	I	12	7313.63	I
90	4894.68	I	120	5580.03	I	15	6230.51	I	55cw	7336.18	I
60	4900.86	I	90	5586.24	I	90 h	6233.73	I	4	7346.25	I
150	4907.18	I	75	5586.83	I	55	6250.47	I	4	7356.65	I
180	4911.40	I	18	5592.25	I	240	6262.25	I	11	7362.25	I
55	4953.52	I	18	5599.80	I	55	6266.95	I	55cw	7369.60	I
55	4960.21	I	18	5605.86	I	15 h	6285.95	I	720	7370.22	II
55	4962.55	I	40	5618.81	I	60	6291.34	I	4	7387.36	I
45	4975.76	I	60	5622.44	I	170	6299.77	I	12	7389.16	I
180	5013.17	I	75	5632.54	I	230	6303.41	II	11 h	7404.41	I
170	5022.91	I	210	5645.80	I	24 h	6313.78	I	300	7426.57	II
110	5029.54	I	15	5651.11	I	15	6318.58	I	21 h	7436.59	I
90	5033.55	I	60	5673.85	I	75	6335.82	I	8	7470.53	I
75	5067.95	I	27	5681.10	I	120cw	6350.04	I	5 h	7491.00	I
75 h	5092.69	I	27	5684.24	I	60	6355.89	I	50cw	7528.70	I
90 h	5096.44	I	60	5730.87	I	60	6369.25	I	5 h	7533.02	I
170	5114.37	I	60	5739.00	I	55	6382.73	I	6	7547.32	I
90	5124.77	I	330	5765.20	I	75	6383.86	I	160	7583.91	I
170	5129.10	I	180	5783.69	I	120cw	6400.93	I	60cw	7742.57	I
90	5130.08	I	15	5792.72	I	40	6406.11	I	70	7746.19	I
210	5133.52	I	60	5800.27	I	180	6410.04	I	8 h	7803.32	I
270	5160.07	I	170	5818.74	II	140	6411.32	I	8	7818.21	I
210	5166.70	I	600cw	5830.98	I	55	6428.29	I	35	7887.99	I
60	5193.74	I	27	5845.77	I	830	6437.64	II	7	8015.47	I
200	5199.85	I	27	5860.97	I	18	6439.93	I	24cw	8209.80	I
110	5200.96	I	15	5864.77	I	120	6457.96	I	15cw	8226.81	I
120	5206.44	I	90	5872.98	II	12	6470.70	I	6 h	8464.71	I
750	5215.10	I	15	5895.31	I	18	6483.02	I	21cw	8642.67	I
300	5223.49	I	27	5902.97	I	45	6501.55	I	7	8727.77	I

Eu I and II

Intensity	Wavelength	
6	8782.46	I
12cw	8790.88	I
18	8870.30	I

Eu III

Ref. 312 - J.R.

Air

10	2073.40	III
10	2093.50	III
30	2124.69	III
10	2167.12	III
10	2173.59	III
10	2184.68	III
10	2190.59	III
10	2194.81	III
20	2211.85	III
20	2212.63	III
20	2214.66	III
10	2215.34	III
30	2217.23	III
30	2219.33	III
20	2219.42	III
10	2223.13	III
10	2235.17	III
10	2240.14	III
10	2261.88	III
20	2265.74	III
10	2269.39	III
20	2276.85	III
40	2291.62	III
20	2304.37	III
10	2311.92	III
10	2327.69	III
10	2334.56	III
10	2336.96	III
10	2339.84	III
10	2343.10	III
10	2346.83	III
10	2347.64	III
10	2350.38	III
200	2350.51	III
10	2352.28	III
10	2357.87	III
10	2359.08	III
10	2360.65	III
20	2363.76	III
20	2368.04	III
20	2374.08	III
10	2375.20	III
4000	2375.46	III
10	2376.42	III
20	2377.23	III
10	2381.81	III
10	2383.62	III
20	2387.29	III
20	2389.11	III
10	2389.98	III
20	2391.11	III
20	2391.90	III
10	2392.59	III
10	2394.66	III
20	2395.62	III
20	2398.79	III
20	2401.00	III
20	2402.34	III
20	2404.08	III
10	2406.14	III
20	2407.30	III
20	2408.32	III

Eu III

Intensity	Wavelength	
10	2409.63	III
20	2410.08	III
40	2412.02	III
20	2412.96	III
20	2413.26	III
10	2413.41	III
10	2419.11	III
10	2419.25	III
10	2419.58	III
30	2422.00	III
10	2422.90	III
10	2425.33	III
50	2425.68	III
40	2427.67	III
40	2429.32	III
10 d	2429.66	III
10	2430.04	III
10	2431.49	III
10	2431.76	III
10	2432.55	III
10	2433.65	III
10	2434.19	III
100 d	2435.14	III
20	2436.39	III
10	2436.77	III
10	2438.83	III
10	2440.26	III
50	2440.67	III
1000	2444.38	III
4000	2445.99	III
30 h	2446.43	III
20	2448.57	III
20	2451.24	III
10	2451.73	III
30	2455.22	III
10	2461.79	III
30	2463.30	III
30	2464.47	III
40	2470.51	III
10	2474.94	III
10	2476.24	III
20	2476.45	III
10	2477.78	III
20	2480.02	III
20	2483.29	III
10	2486.92	III
10	2488.91	III
10	2490.50	III
10	2491.08	III
10	2492.48	III
10	2496.92	III
10	2499.17	III
2000	2513.76	III
20	2517.94	III
200	2522.14	III
10	2539.14	III
10	2548.30	III
20	2548.59	III
10	2554.50	III
10	2558.07	III
10	2560.36	III
10	2594.71	III
20	2594.76	III
10	2596.34	III
10	2604.44	III
30	2608.34	III
30	2610.09	III
50 c	2616.11	III
20	2616.26	III

Eu III

Intensity	Wavelength	
10	2616.33	III
10	2616.35	III
10	2620.79	III
20	2623.33	III
10	2626.98	III
20 c	2628.46	III
10	2628.82	III
10	2631.98	III
30 c	2642.27	III
20	2645.22	III
20 c	2650.93	III
10	2653.19	III
10	2655.09	III
10	2662.24	III
20 c	2666.86	III
20 c	2668.21	III
40 c	2676.09	III
20 c	2683.21	III
20	2686.13	III
20 c	2687.74	III
40 c	2693.51	III
10	2694.80	III
20	2699.87	III
20 c	2700.78	III
10 c	2708.25	III
20 c	2708.84	III
10	2712.08	III
50 c	2720.67	III
20 c	2725.54	III
10	2743.94	III
10	2752.68	III
20	2755.12	III
10	2757.75	III
20 c	2760.21	III
10	2761.72	III
10 c	2766.26	III
20 c	2768.38	III
10 c	2768.54	III
10	2769.71	III
20 c	2780.48	III
20	2792.51	III
10	2808.09	III
10	2817.58	III
20 c	2839.56	III
20	2844.99	III
10 c	2848.44	III
20	2850.39	III
10 c	2892.60	III
40	2912.23	III
40 c	2912.64	III
10	2913.04	III
10	2928.91	III
20 c	2931.00	III
10 c	2950.20	III
20	2956.74	III
10	2956.90	III
10 c	2972.30	III
30 c	2982.29	III
20 c	3000.11	III
20	3006.37	III
20 c	3013.28	III
10 c	3018.43	III
20 c	3022.08	III
50 c	3022.69	III
20 c	3023.40	III
100 c	3023.93	III
10	3025.32	III
10 c	3026.09	III
200 c	3026.79	III

Eu III

Intensity	Wavelength	
50 c	3029.92	III
20 c	3031.24	III
40 c	3032.84	III
20 c	3036.98	III
10	3038.64	III
10	3039.05	III
20 c	3039.98	III
10	3054.07	III
10 c	3054.97	III
20	3076.43	III
10 c	3089.09	III
10	3105.25	III
10	3109.67	III
10	3129.31	III
10	3142.54	III
50 c	3171.00	III
10	3178.08	III
20 h	3178.87	III
50 c	3183.78	III
10 h	3191.46	III
20 c	3194.34	III
10	3206.30	III
10	3208.95	III
10 h	3213.84	III
10	4837.98	III
50	6666.35	III
30	7221.84	III
20	7690.44	III
10	8079.07	III

FLUORINE (F)

Z = 9

F I and II

Refs. 169,224 - G.V.S.

Vacuum

30	375.30	II
30	380.90	II
40	407.04	II
50	430.91	II
40	431.55	II
40	435.64	II
70	457.18	II
40	471.95	II
60	472.00	II
50	472.71	II
40	473.02	II
90	484.60	II
50	513.64	II
70	514.94	II
70	546.85	II
60	547.87	II
50	548.32	II
40	548.52	II
90	605.67	II
80	606.29	II
100	606.80	II
70	606.92	II
80	607.47	II
90	608.06	II
15	780.39	I
10	780.52	I
10	782.38	I
12	791.88	I
10	792.54	I
10	794.42	I
150	806.96	I
125	809.60	I

F I and II			F I and II			F I and II			F III		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
500	951.87	I	5	3948.56	I	400	6708.28	I	60	255.77	III
1000	954.83	I	150	3972.04	II	7000	6773.98	I	70	255.86	III
750	955.55	I	160	3972.67	II	1500	6795.53	I	70	261.71	III
500	958.52	I	170	3974.78	II	9000	6834.26	I	60	261.75	III
20	972.40	I	240	4024.73	II	50000	6856.03	I	80	263.81	III
350	973.90	I	220	4025.01	II	8000	6870.22	I	70	279.69	III
100	976.22	I	230	4025.49	II	15000	6902.48	I	80	315.22	III
40	976.51	I	160	4083.91	II	6000	6909.82	I	70	315.54	III
100	977.75	I	190	4103.07	II	4000	6966.35	I	60	315.75	III
40	1129.76	II	170	4103.22	II	45000	7037.47	I	100	429.51	III
40	1327.06	II	200	4103.51	II	30000	7127.89	I	110	430.15	III
50	1328.11	II	180	4103.71	II	130	7179.90	II	80	430.22	III
40	1333.59	II	170	4103.87	II	15000	7202.36	I	90	464.29	III
50	1343.60	II	170	4109.16	II	130 h	7211.79	II	100	465.11	III
40	1344.04	II	160	4116.54	II	1000	7309.03	I	120	508.39	III
50	1400.61	II	150	4119.21	II	15000	7311.02	I	120	567.69	III
40	1407.14	II	140	4207.15	II	700	7314.30	I	110	567.75	III
60	1493.09	II	170 h	4225.16	II	5000	7331.96	I	80	630.14	III
50	1493.24	II	150 h	4244.12	II	10000	7398.69	I	90	630.20	III
40	1493.31	II	200	4246.23	II	4000	7425.65	I	120	656.12	III
40	1702.13	II	190	4246.39	II	2200	7482.72	I	130	656.87	III
40	1744.75	II	180	4246.59	II	2500	7489.16	I	140	658.33	III
50	1745.55	II	170	4246.77	II	900	7514.92	I	80	1219.03	III
60	1747.39	II	160	4246.84	II	5000	7552.24	I	80	1266.87	III
	Air		170 h	4275.36	II	5000	7573.38	I	90	1267.71	III
100	2556.11	II	160 h	4277.53	II	7000	7607.17	I	70	1297.54	III
100	2871.40	II	160 h	4278.93	II	18000	7754.70	I	70	1359.92	III
120	3059.99	II	200	4299.17	II	15000	7800.21	I	110	1498.93	III
140	3153.49	II	160	4446.53	II	300	7879.18	I	120	1502.01	III
170	3202.76	II	170	4446.72	II	500	7898.59	I	110	1504.18	III
140	3264.08	II	180	4447.19	II	350	7936.31	I	140	1504.79	III
140	3414.65	II	140	4734.38	II	300	7956.32	I	130	1506.30	III
150	3416.45	II	170	4859.39	II	80	8016.01	II	110	1506.77	III
140	3416.80	II	160	4933.26	II	1000	8040.93	I	100	1553.02	III
160	3417.00	II	6	4960.65	I	900	8075.52	I	110	1557.59	III
160	3472.96	II	140	5002.00	II	350	8077.52	I	100	1563.73	III
150	3473.31	II	150	5173.25	II	350	8126.56	I	100	1565.54	III
170	3474.78	II	15	5230.41	I	600	8129.26	I	100	1623.40	III
190	3501.39	II	12	5279.01	I	300	8159.51	I	100	1650.76	III
200	3501.45	II	18	5540.52	I	600	8179.34	I	130	1670.39	III
200	3501.57	II	12	5552.43	I	300	8191.24	I	140	1677.40	III
180	3502.84	II	10	5577.33	I	350	8208.63	I	100	1716.99	III
200	3502.96	II	160	5589.27	II	2500	8214.73	I	120	1770.09	III
210	3503.11	II	20	5624.06	I	3000	8230.77	I	150	1770.67	III
170	3505.37	II	12	5626.93	I	500	8232.19	I	110	1772.93	III
200	3505.52	II	15	5659.15	I	1500	8274.62	I	140	1773.36	III
220	3505.63	II	40	5667.53	I	2000	8298.58	I	160	1791.65	III
160	3522.89	II	90	5671.67	I	600	8302.40	I	110	1803.03	III
150	3536.87	II	18	5689.14	I	900	8807.58	I	100	1804.70	III
160	3541.77	II	25	5700.82	I	1000	8900.92	I	170	1805.90	III
160	3590.92	II	25	5707.31	I	300	8912.78	I	110	1839.30	III
6	3594.10	I	12	5950.15	I	350	9025.49	I	120	1839.97	III
170	3598.69	II	25	5959.19	I	400	9042.10	I	110	1840.14	III
180	3601.39	II	70	5965.28	I	350	9178.68	I	80	1900.76	III
190	3602.84	II	50	5994.43	I	200	9433.67	I		Air	
12	3668.17	I	150	6015.83	I	25	9505.30	I	100	2027.44	III
180	3704.53	II	80	6038.04	I	12	9662.04	I	120	2030.32	III
160	3710.35	II	900	6047.54	I	25	9734.34	I	120	2217.17	III
160	3739.57	II	100	6080.11	I	15	9822.11	I	120	2452.07	III
140	3805.83	II	800	6149.76	I	12	9902.65	I	130	2464.85	III
270	3847.09	II	400	6210.87	I	80 h	10047.98	II	130	2470.29	III
260	3849.99	II	13000	6239.65	I	15	10285.45	I	120	2478.73	III
250	3851.67	II	140	6247.90	II	20	10862.31	I	150	2484.37	III
5	3898.48	I	10000	6348.51	I				120	2542.77	III
190	3898.83	II	8000	6413.65	I		F III		120	2580.04	III
180	3901.93	II	450	6569.69	I		Ref. 225 - G.V.S.		130	2583.81	III
170	3903.82	II	300	6580.39	I		Vacuum		120	2593.23	III
8	3930.69	I	400	6650.41	I	50 h	230.12	III	130	2595.53	III
5	3934.26	I	1800	6690.48	I	50	255.72	III	140	2599.28	III

F III

Intensity	Wavelength	
130	2625.01	III
140	2629.70	III
120	2656.44	III
130	2755.55	III
160	2759.63	III
120	2788.15	III
160	2811.45	III
140	2833.99	III
150	2835.63	III
150	2860.33	III
120	2862.86	III
140	2887.58	III
150	2889.45	III
120	2905.30	III
140	2913.29	III
160	2916.34	III
140	2932.49	III
140	2994.28	III
120 h	2997.21	III
130	2997.53	III
120	2999.47	III
130	3039.25	III
120	3039.75	III
160	3042.80	III
150	3049.14	III
140	3113.62	III
160	3115.70	III
180	3121.54	III
140	3124.79	III
140	3134.23	III
140	3146.99	III
180	3174.17	III
170	3174.76	III
120	3214.00	III
140 h	4420.30	III
120 h	4427.35	III
120 h	4432.32	III
140 h	4479.99	III
150	5012.54	III
160	5110.99	III
140	5753.17	III
120	5761.20	III
150	6091.82	III
140	6125.50	III
130	6233.57	III
140	6363.05	III
120	7336.77	III
130	7354.94	III

F IV

Refs. 68,226 - G.V.S.

Vacuum

30	169.79	IV
30	169.84	IV
30	171.07	IV
40	176.37	IV
40	181.52	IV
40	181.57	IV
30	187.24	IV
50	196.39	IV
60	196.45	IV
50	199.76	IV
50	199.80	IV
50	199.85	IV
50	199.93	IV
50	200.00	IV
70	200.09	IV
60	201.01	IV
70	201.06	IV

F IV

Intensity	Wavelength	
60	201.10	IV
80	201.16	IV
60	201.22	IV
90	208.25	IV
70	213.85	IV
70	214.06	IV
70	220.77	IV
60	226.94	IV
50	227.10	IV
60	233.22	IV
50	233.39	IV
70	239.86	IV
70	240.02	IV
90	240.08	IV
70	240.15	IV
70	240.28	IV
70	240.37	IV
100	251.03	IV
60	270.23	IV
140	419.65	IV
150	420.05	IV
160	420.73	IV
150	430.76	IV
130	490.57	IV
160	491.00	IV
50	497.38	IV
60	497.83	IV
70	498.80	IV
140	570.64	IV
140	571.30	IV
150	571.39	IV
160	572.66	IV
140	676.12	IV
130	677.15	IV
150	677.22	IV
130	678.99	IV
160	679.21	IV

Air

40	2171.44	IV
50	2298.29	IV
40	2451.58	IV
50	2456.92	IV
40	2820.74	IV
50	2826.13	IV

F V

Refs. 68,226 - G.V.S.

Vacuum

40	134.54	V
40	147.95	V
50	148.00	V
40	152.51	V
40	158.54	V
40	162.27	V
40	163.50	V
50	163.56	V
90	165.98	V
100	166.18	V
40	174.70	V
50	178.43	V
40	178.59	V
40	182.98	V
40	186.72	V
40	186.79	V
50	186.84	V
40	186.97	V
40	187.01	V
60	190.57	V
70	190.84	V

F V

Intensity	Wavelength	
40	191.97	V
40	205.55	V
100	464.37	V
110	465.37	V
120	465.98	V
100	466.99	V
90	506.16	V
100	508.08	V
70	513.97	V
60	514.08	V
80	524.59	V
90	525.29	V
100	526.30	V
70	647.67	V
100	647.77	V
110	647.87	V
70	647.97	V
130	654.03	V
110	657.23	V
140	657.33	V
60	757.04	V
60	1082.31	V
70	1088.39	V

Air

10	2229.18	V
20	2252.72	V
20	2450.63	V
10	2461.33	V
10	2693.98	V
10	2702.30	V
10	2703.96	V
20	2707.17	V

FRANCIUM (Fr)

Z = 87

Fr I

Ref. 408 - C.H.C.

Air

7177. I

GADOLINIUM (Gd)

Z = 64

Gd I and II

Ref. 1 - C.H.C.

Air

100	2468.22	II
55	2471.58	II
35	2485.67	II
70	2487.46	II
110	2488.72	II
55	2493.29	II
35	2496.35	II
45	2499.04	II
28	2543.68	II
28	2586.13	II
28	2661.50	II
70	2720.50	II
430	2750.22	II
460	2764.08	II
40	2768.51	II
320	2769.81	II
230	2770.17	II
21	2770.98	II
45	2778.76	I
45	2779.14	II
440	2781.40	II

Gd I and II

Intensity	Wavelength	
70	2787.68	I
390	2791.96	II
100	2794.66	II
930	2796.93	II
60	2808.38	II
750	2809.72	II
160	2810.93	II
45	2814.01	II
300	2833.75	II
35	2836.69	II
70	2837.00	II
560	2840.23	II
140	2841.33	II
40	2853.91	II
60	2856.52	II
19	2859.78	II
120	2862.48	II
60	2865.06	II
40	2866.33	II
40	2871.75	II
460	2881.33	II
40	2882.13	II
130	2885.60	II
35	2907.44	II
170	2910.53	II
60	2913.08	II
45	2918.52	II
95	2923.32	II
35	2924.25	II
35	2928.34	II
35	2947.80	II
70	2948.01	II
35	2952.43	I
35	2955.60	II
70	2960.93	II
130	2963.60	II
80	2965.43	II
29	2972.74	II
560	2980.15	II
35	2983.74	II
40	2991.52	II
95	2993.04	II
1200	2999.04	II
370	3002.86	II
100	3005.09	II
2100	3010.13	II
130	3012.19	II
1900	3027.60	II
120	3028.98	II
2100	3032.84	II
1600	3034.05	II
130	3043.01	I
160	3046.48	I
280	3053.57	II
100	3059.92	I
1000	3068.64	II
560	3072.56	II
640	3076.92	II
150	3077.08	II
2100	3081.99	II
140	3084.01	II
280	3089.95	II
140	3092.06	II
460	3098.64	II
190	3098.90	II
3500	3100.50	II
120	3101.18	II
230	3101.91	II
580	3102.55	II

Gd I and II			Gd I and II			Gd I and II			Gd I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
130	3108.36	II		3397.32	I	830	3610.76	II	770	3791.17	II
170	3111.19	I	200	3399.41	II	220	3610.91	II	490	3792.39	II
160	3113.17	II	540	3399.99	II	540	3613.39	II	5100	3796.37	II
120	3118.60	II	540	3402.07	II	270 d	3614.21	II	720	3801.29	II
120	3119.01	I	200	3406.92	I		3614.42	I	210	3804.39	I
510	3119.94	II	1100 d	3407.56	II	430	3617.16	II	210	3805.09	II
100	3120.18	II		3407.61	II	390	3620.46	II	560	3805.52	II
370	3123.99	II	250	3409.30	II	270	3624.89	II	3700	3813.97	II
120	3124.25	II	220	3411.02	I	250	3629.51	II	430	3814.74	II
130	3128.56	II	220	3413.27	II	330	3634.76	II	770	3816.64	II
130	3130.81	II	1400	3416.95	II	220	3639.05	II	430	3818.75	II
100	3133.09	II	1400	3418.73	II	250	3640.18	II	350	3826.05	II
460	3133.85	II	6900	3422.47	II	330	3641.39	II	230	3827.33	II
210	3135.03	II	390	3422.75	II	870	3645.62	II	230	3829.46	II
190	3136.93	I	1100	3423.90	I	6100	3646.19	II	370	3831.80	II
190	3137.30	I		3423.92	II	310	3649.44	II	210	3832.97	I
120	3138.71	I	830	3424.59	II	450	3650.95	II	330	3834.99	II
230	3143.13	II	390	3425.93	II	620	3652.54	II	970	3836.91	II
930	3145.00	II	220	3428.47	II	3900	3654.62	II	1000	3839.64	II
370	3145.52	II	690	3432.99	II	3100	3656.15	II	1200	3842.20	II
230	3146.88	II	1700	3439.21	II	210	3658.19	I	1400	3843.28	I
980	3156.53	II	830	3439.78	II	1400	3662.26	II	1400	3844.58	II
200	3158.63	I	2700	3439.99	II	2700	3664.60	II	3300	3850.69	II
140	3160.69	II	390	3449.62	II	2000	3671.20	II	5100	3850.97	II
980	3161.37	II	1400	3450.38	II	1000	3674.05	I	4300	3852.45	II
220	3190.28	I	1100	3451.23	II	350	3679.21	I	470	3855.56	II
220	3199.30	I	540	3454.14	II	2000	3684.13	I	250	3863.05	II
160	3199.58	I	880	3454.90	II	720	3686.33	II	1600	3866.99	I
110	3203.41	I	200	3455.27	I	3100	3687.74	II	250	3873.57	I
690	3223.74	II	200	3457.05	II	210	3694.03	II	220	3875.46	II
	3223.78	I	220	3461.95	II	2000	3697.73	II	1500	3894.70	II
110	3225.46	II	220	3463.00	II	1300	3699.73	II	450	3895.79	II
160	3226.32	II	2700	3463.98	II	2700	3712.70	II	750	3902.40	II
220	3232.78	I	330	3466.95	II	2000	3713.57	I	300	3902.71	I
100	3250.19	II	1700	3467.27	II	1400	3716.36	II	240	3904.29	I
110	3259.25	II	1700	3468.99	II	2000	3717.48	I	450	3905.65	I
540	3266.73	I	1400	3473.22	II	1800 d	3719.45	II	2200	3916.51	II
250	3267.64	I	2200	3481.28	II		3719.53	II	450	3923.25	II
140	3268.34	II	1700	3481.80	II	250	3722.07	II	1200	3934.79	I
110	3274.18	II	490	3482.60	II	430	3725.47	II		3934.82	II
110	3279.53	II	220	3486.20	I	1500	3730.84	II	220	3935.38	I
100	3281.61	II	980	3491.95	II	270	3732.32	I	450	3941.80	I
250	3282.25	I	1700	3494.40	II	230	3732.45	II	590	3942.63	I
	3282.30	II	1400	3505.51	II	230	3732.67	I	270	3943.24	I
430	3291.48	I	780	3512.22	II	510	3733.08	II	220	3943.62	I
370	3292.21	II	1100	3512.50	II	490	3739.76	I	1400	3945.54	I
430	3294.08	I	830	3513.65	I	330	3740.02	II	300	3952.00	II
330	3313.73	II	980	3524.20	II	4500	3743.47	II	590	3953.37	I
200	3315.59	II	430	3528.54	II	620	3744.83	I	1200	3957.67	II
430	3330.34	II	540	3542.77	II	230	3757.74	II	750	3959.44	II
1400	3331.38	II	4300	3545.80	II	1000	3757.94	I		3959.52	II
830	3332.13	II	3900	3549.36	II	1400	3758.31	II	220	3963.66	II
1100	3336.18	II	1400	3557.05	II	820	3759.00	II	590	3966.28	I
590	3345.98	II	540	3558.19	II	620	3760.71	II	590	3968.26	II
200	3350.10	II	430	3558.47	II	290	3760.92	II	750	3969.00	I
5400	3350.47	II	200	3564.05	II	870	3762.20	I	270	3969.29	II
220	3357.61	I	690	3571.93	II	210	3763.33	II	450	3971.75	II
270	3358.43	II	330	3574.74	II	370	3764.20	II	390	3972.71	I
4300	3358.62	II	390	3578.36	II	870	3767.04	II	590	3973.98	II
780	3360.71	II	980	3581.91	II	8700	3768.39	II	300	3974.81	I
5400	3362.23	II	5400	3584.96	II	620	3769.45	II	750	3979.33	I
270	3364.24	II	540	3590.47	II	1400	3770.69	II	450	3987.21	II
200	3365.59	II	1100	3592.71	II	250	3771.26	I	470	3987.84	I
220	3374.69	II	200	3593.44	II	210	3773.45	I	320	3992.69	I
220	3379.76	II	540	3600.96	II	210	3776.83	I	220	3993.21	II
220	3380.52	II	1100	3604.87	I	1000	3782.34	II	650	3994.16	II
1100	3392.53	II	270	3605.26	II	2900	3783.05	I	700	3996.32	II
540	3395.12	II	250	3605.66	II	1100	3787.56	II	320	3997.76	II
220 d	3397.22	I	830	3608.75	II	200	3790.63	I	470	4001.26	II

Gd I and II			Gd I and II			Gd I and II			Gd I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
260	4004.94	II	750	4191.07	II	220	4478.80	II	170	4865.02	II
320	4008.33	I	750	4191.63	I	280	4481.06	II	120	4871.50	I
300	4008.91	II	450	4197.68	II	220	4483.33	II	280	4934.12	I
300	4013.80	II	590	4204.86	II	220	4484.70	I	220	4938.61	I
200	4015.58	I	1300	4212.00	II	280	4486.90	I	110	4952.47	I
300	4017.25	I	970	4215.02	II	500	4497.13	I	130	4958.79	I
430	4017.71	I	650	4217.20	II	220	4497.32	I	65	5010.82	II
300	4019.73	I	320	4225.03	I	430	4506.21	I	55	5011.74	I
300	4022.33	II	4800	4225.85	I	140	4506.33	II	750	5015.04	I
1100	4023.14	I	220	4227.14	II	140	4514.50	II	55	5023.13	II
810	4023.35	I	220	4229.80	II	1100	4519.66	I	65	5031.29	II
220	4027.61	I	650	4238.78	II	300	4522.82	II	75	5039.09	I
1100	4028.15	I	200	4246.57	II	150	4524.12	I	65	5050.88	II
860	4030.88	I	1700	4251.73	II	910	4537.81	I	55	5073.74	I
700	4033.49	I	860	4253.37	II	220	4540.02	II	55	5082.80	I
340	4035.40	I	650	4253.61	II	300	4542.03	I	95	5092.25	II
260	4036.84	I	810	4260.12	I	240	4548.00	I	65	5096.06	II
1400	4037.33	II	1600	4262.09	I	120	4558.08	II	130	5098.38	II
700	4037.90	II	650	4266.60	I	130	4573.81	I	55	5100.94	II
410	4043.71	I	470	4267.00	I	260	4575.91	I	910	5103.45	I
1600	4045.01	I	300	4274.17	I	280	4579.59	I	180	5108.91	II
270	4046.84	II	910	4280.49	II	410	4581.29	I	120	5125.56	II
270	4047.09	I	430	4285.82	I	130	4582.53	II	65	5130.28	II
270	4049.20	I	300	4286.12	I	410	4583.07	I	65	5135.59	I
1300	4049.43	II	540	4296.08	II	160	4586.99	I	75	5136.04	I
2200	4049.86	II	220	4297.17	II	220	4596.98	II	85	5140.84	II
270	4050.37	I	430	4299.29	I	320	4597.91	II	75	5141.50	I
810	4053.29	II	1100	4306.34	I	410	4598.90	I	75	5142.68	I
2600	4053.64	I	260	4309.29	I	340	4601.05	II	860	5155.84	I
810	4054.72	I	1800	4313.84	I	240	4602.93	I	55	5156.76	II
2600	4058.22	I	520	4314.40	I	520	4614.50	I	75	5158.48	I
650	4059.88	I	520	4316.05	II	140	4624.42	I	75	5163.70	I
270	4061.30	II	370	4320.52	I	430	4636.64	I	55	5164.54	II
650	4062.59	II	750	4321.11	II	110	4639.00	II	190	5176.28	II
1900	4063.39	II		4321.20	I	170	4640.04	I	55	5187.24	II
540	4063.59	II	2600 d	4325.57	II	170	4646.00	I	55	5187.88	I
260	4066.04	I		4325.69	I	170	4647.64	I	55	5191.08	II
520	4068.35	I	1900	4327.12	I	170 d	4648.59	I	410	5197.77	I
260	4068.74	I	370	4329.58	I		4648.70	I	55	5210.49	II
750	4070.29	II	340	4330.61	II	430	4653.54	I	85	5217.48	I
	4070.39	II	240	4331.38	I	140 h	4670.87	I	280	5219.40	I
650	4073.20	II	450	4341.28	II	170	4679.18	I	75	5220.30	II
300	4073.76	II	910	4342.18	II	260	4680.04	I	130	5233.93	I
1300	4078.44	II	1000	4344.30	II	430	4683.33	I	65	5246.87	I
2800	4078.70	I	2200	4346.46	I	140	4688.12	I	320	5251.18	I
520	4083.70	I	910	4346.62	I	700	4694.33	I	120	5252.14	II
1500	4085.56	II	220	4347.31	II	170	4695.49	I	85	5254.75	I
260	4087.69	II	300	4369.77	II	430	4697.42	I	140	5255.80	I
650	4090.41	I	970	4373.83	I	170	4703.13	I	65	5268.78	I
1100	4092.71	I	280	4392.06	I	200	4709.78	I	55	5272.91	I
260	4093.72	I	1400	4401.86	I	110	4721.46	I	55	5282.48	I
260	4094.48	II	520	4403.14	I	150	4728.47	II	280	5283.08	I
2600	4098.61	II	260	4406.67	II	220	4732.60	II	280	5301.67	I
520	4098.90	II	260	4408.25	II	260	4735.75	I	220	5302.76	I
650	4100.26	I	220	4409.25	I	410	4743.65	I	55	5306.70	I
390	4111.44	II	520	4411.16	I	110	4745.82	I	280	5307.30	I
2200	4130.37	II	860	4414.16	I	320	4758.70	I	130	5321.50	I
270	4131.48	II	700	4414.73	I	110	4760.74	I	280	5321.78	I
1100	4132.28	II	340	4419.03	II	130	4763.82	I	110	5327.32	I
750	4134.16	I	1400	4422.41	I	470	4767.24	I	65	5328.30	I
410	4137.10	II	1100	4430.63	I	180	4781.92	I	170	5333.30	I
280	4148.86	I	240 d	4436.10	I	300	4784.62	I	55	5337.53	I
540	4162.73	II		4436.22	II	110	4786.75	I	300	5343.00	I
280	4163.09	II	300	4464.74	I	140	4801.05	II	85	5345.13	I
280	4167.16	II	300	4466.55	II	220	4807.45	I	75	5345.68	I
	4167.27	I		4466.60	I	320	4821.69	I	200	5348.67	I
2400	4175.54	I	520	4467.08	I	130	4835.26	I	300	5350.38	I
2400	4184.25	II	700	4474.13	I	110	4848.10	I	240	5353.26	I
2200	4190.78	I	860	4476.12	I	110	4862.59	I	55	5361.66	I

Gd I and II			Gd I and II			Gd I and II			Gd I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
95	5365.38	I	75	6305.15	II	45	7006.16	II	14 h	8849.14	I
95	5369.92	I	30	6309.11	II	10	7016.60	I	18 h	8867.31	I
150	5370.63	I	27	6317.19	I	21	7037.26	II			
85	5389.50	I	40	6331.35	I	14	7051.00	II		Gd III	
85	5413.20	I	17	6333.75	I	13	7054.62	II	Refs. 46,137,151 - J.F.K.		
85	5415.69	I	17	6336.34	I	10	7058.02	II		Vacuum	
65	5453.46	I	27	6346.65	II	10	7068.09	II	600	1813.47	III
55	5583.68	II	27 h	6351.72	I	18	7071.00	I	900	1946.26	III
55 d	5591.85	I	17	6363.23	I	18	7073.63	I	1100	1974.34	III
190	5617.91	I	40	6380.95	II	14	7098.11	I	2200	1975.24	III
65	5629.55	I	17	6382.19	II	14	7098.73	I		Air	
110	5632.25	I	22	6408.55	I	10 h	7116.77	II	900	2008.79	III
260	5643.24	I	22	6422.42	II	21	7118.86	II	3400	2018.07	III
55bl	5680.89	GdO	17	6424.52	I	35	7122.57	I	1800	2027.82	III
390	5696.22	I	19 h	6470.29	I	13	7135.73	II	800	2046.02	III
95	5701.35	I	15	6480.11	II	18	7147.31	II	500	2057.79	III
65	5709.42	I	40 h	6538.15	I	13	7158.28	I	1500	2080.08	III
120	5733.86	II	22	6549.25	I	170	7168.37	I	1800	2098.20	III
85	5746.36	I	55	6564.78	I	21	7172.26	II	1300	2125.68	III
85 d	5754.17	I	10	6568.00	II	28	7189.57	II	1400	2148.03	III
75	5776.02	I	10	6573.80	I	13	7197.08	II	1700	2176.84	III
240	5791.38	I	30	6591.60	I	13	7201.41	II	1700	2223.95	III
65 h	5796.80	I	15	6593.42	I	10	7228.02	I	1700	2236.73	III
55	5802.92	I	10	6610.04	II	25	7233.45	I	1200	2239.84	III
55hs	5807.72	I	50	6634.36	II	14	7252.70	II	1500	2243.75	III
55 h	5809.22	I	35	6640.08	I	28	7262.66	I	1700	2250.18	III
55	5815.85	II	10	6642.76	I	14	7291.35	I	1300	2257.05	III
65hs	5819.51	GdO	30	6643.98	I	21	7313.28	I	1300	2292.51	III
55	5840.47	II	10	6646.85	I	18	7324.89	II	1000	2300.38	III
220	5851.63	I	10	6653.55	I	14	7373.81	I	1200	2303.72	III
55	5855.24	II	10	6679.56	II	14	7376.41	I	1500	2307.03	III
280	5856.22	I	35	6681.23	II	13	7377.27	II	1100	2313.50	III
55	5860.73	II	10	6692.86	I	13	7380.28	I	1700	2313.56	III
65	5877.26	II	10	6704.18	II	13	7394.90	II	1000	2315.09	III
55	5886.46	I	14	6718.14	II	13	7430.19	I	1400	2323.12	III
55	5904.07	II	17	6727.83	II	35	7441.85	I	1700	2323.18	III
110	5904.56	I	85	6730.73	I	40	7464.36	I	2200	2323.78	III
170	5911.45	II	50	6752.67	II	55	7562.97	I	1900	2329.35	III
65	5913.55	II	14	6753.91	II	10	7563.19	II	2100	2335.01	III
55	5916.77	I	14	6783.39	I	10	7588.20	I	1600	2336.02	III
85	5930.29	I	26	6786.33	II	10	7611.78	I	1900	2338.97	III
85	5936.84	I	10	6787.18	I	21	7621.96	I	1600	2339.88	III
65	5937.71	I	12	6814.56	I	21	7650.32	I	2100	2342.74	III
55 h	5940.95	GdO	26	6816.49	I	25	7672.56	I	2500	2346.52	III
55 h	5942.78	GdO	17	6820.90	I	10	7676.06	I	2800	2359.31	III
55	5951.60	II	100	6828.25	I	13	7694.45	I	1900	2360.87	III
55	5956.48	II	35	6846.60	II	80	7733.50	I	2300	2361.91	III
85	5977.25	I	30	6857.13	II	35	7749.30	I	1400	2362.38	III
110 h	5988.02	I	15	6864.25	I	10	7755.97	I	2100	2363.26	III
85	5999.08	I	21	6887.63	II	10	7766.48	II	1600	2365.22	III
65	6000.96	GdO	14	6900.73	II	11 h	7844.87	I	2000	2373.38	III
75 h	6001.87	GdO	100	6916.57	I	10	7845.80	I	1300	2374.29	III
55	6004.57	II	21	6920.62	II	35	7846.35	II	1300	2381.38	III
55	6008.71	I	15	6924.99	II	35	7856.93	I	1600	2387.82	III
55	6021.13	I	21	6926.49	I	14	7869.72	I	2000	2388.77	III
55	6080.65	II	17	6945.98	II	25	7930.25	II	1200	2393.86	III
430	6114.07	I	15	6957.74	II	13	8077.59	I	1200	2397.34	III
55	6180.42	II	15	6959.24	II	18	8146.15	I	1200	2405.03	III
110bl	6182.68	GdO	14	6964.33	I	11	8218.08	I	1300	2408.41	III
110bl	6200.86	GdO	15	6971.66	II	10	8275.42	I	1200	2409.35	III
110bl	6211.71	GdO	12	6976.35	II	10	8349.73	I	1500	2466.84	III
110bl	6220.93	GdO	10	6978.27	II	11	8398.30	I	1100	2469.14	III
55bl	6231.62	GdO	26 h	6980.86	I	10	8445.47	I	1300	2499.53	III
75bl	6241.66	GdO	50	6985.89	II	13 h	8527.88	I	1600	2520.38	III
55 b	6252.12	GdO	10	6988.75	II	21	8668.63	I	1600	2534.11	III
55bl	6262.64	GdO	75	6991.92	I	11	8770.36	I	1300	2536.10	III
45 b	6273.00	GdO	21	6993.18	I	13	8784.85	I	1600	2551.56	III
85	6289.73	II	60	6996.76	II	10	8795.76	I	2200	2553.90	III
30	6292.87	I	17	7000.75	II	21 h	8832.06	II	2100	2554.04	III

Gd III		
Intensity	Wavelength	
2500	2563.33	III
2100	2564.46	III
1000	2565.04	III
2400	2565.95	III
1800	2569.27	III
1800	2573.57	III
2000	2576.06	III
1300	2576.15	III
1400	2578.13	III
1600	2578.76	III
1700	2583.62	III
2000	2588.21	III
2000	2588.46	III
1300	2595.81	III
1800	2609.77	III
1200	2619.40	III
1200	2621.52	III
1400	2623.52	III
1400	2625.48	III
2000	2628.10	III
1300	2628.99	III
2400	2629.83	III
2100	2632.30	III
1800	2633.32	III
1400	2635.71	III
1600	2636.44	III
1700	2637.15	III
2100	2637.97	III
2100	2638.06	III
2200	2640.53	III
1600	2641.65	III
2100	2643.71	III
1600	2644.52	III
1800	2646.04	III
1800	2646.84	III
1600	2651.48	III
2000	2655.59	III
1900	2656.55	III
2200	2660.83	III
1800	2675.75	III
1800	2679.44	III
1700	2680.63	III
1800	2682.52	III
1500	2683.91	III
1600	2692.78	III
1900	2692.86	III
1500	2694.43	III
2800	2697.39	III
1500	2702.91	III
2800	2703.28	III
1600	2704.53	III
1800	2717.35	III
2700	2727.89	III
450	2751.24	III
1800	2833.83	III
9000	2904.73	III
1800	2918.40	III
9500	2955.53	III
1000	2975.42	III
1000	2984.10	III
1000	3116.59	III
2500	3118.04	III
4000	3176.66	III
400	3253.53	III
400	3330.34	III
400	3371.05	III
400	3402.97	III
450	3624.90	III
250	3700.47	III

Gd III		
Intensity	Wavelength	
300	3831.73	III
300	3910.24	III
300	4016.91	III
600	4177.26	III
400	4279.96	III
300	4314.28	III
300	4445.91	III
600	4684.25	III
600	4715.06	III
600	4782.79	III
250	4976.72	III
5000	5091.70	III
300	5124.06	III
1800	5347.95	III
3000	5365.96	III
1100	5412.62	III
4000	5553.30	III
3000	5587.88	III
3000	5658.98	III
1800	5786.96	III
1500	5862.09	III
1500	5987.85	III
5000	14332.88	III
2000	17474.78	III
800	19996.34	III
800	21259.44	III
600	22493.33	III

Gd IV
Ref. 152 - J.F.K.
Vacuum

Intensity	Wavelength	
1000	967.92	IV
1000	983.42	IV
1000	987.10	IV
1000	987.91	IV
1000	995.04	IV
1000	995.80	IV
1000	996.49	IV
1000	999.24	IV
1000	1000.36	IV
1000	1002.73	IV
1000	1004.46	IV
1000	1005.66	IV
1000	1006.55	IV
1200	1007.24	IV
1200	1063.84	IV
500	1228.37	IV
500	1307.23	IV
500	1313.29	IV
500	1316.71	IV
600	1321.42	IV
500	1330.79	IV
1100	1393.24	IV
1600	1476.98	IV
1500	1705.03	IV
1600	1706.01	IV
2000	1736.24	IV
1500	1815.32	IV
400	1997.89	IV
	Air	
800	2049.28	IV
800	2061.30	IV
800	2070.40	IV
800	2076.66	IV
1000	2094.29	IV
1000	2296.89	IV
1000	2352.66	IV
800	2379.17	IV
900	2385.65	IV

Gd IV		
Intensity	Wavelength	
500	2390.07	IV
700	2392.30	IV
700	2393.29	IV
700	2395.76	IV
500	2396.22	IV
600	2396.27	IV
1400	2397.87	IV
700	2402.70	IV
500	2412.21	IV
900	2419.26	IV
500	2439.84	IV
600	2440.38	IV
600	2468.60	IV

GALLIUM (Ga)

Z = 31

Ga I and II
Refs. 19,132,195,281
- L.J.R.
Vacuum

Intensity	Wavelength	
2	829.60	II
2	958.67	II
1	960.57	II
2	969.19	II
2	998.52	II
3	1002.95	II
5	1012.38	II
3	1019.10	II
5	1023.80	II
8	1033.69	II
1	1113.87	II
3	1119.25	II
5	1130.81	II
1	1167.62	II
2	1173.78	II
3	1186.81	II
1	1227.13	II
5	1286.38	II
5	1327.81	II
20	1414.44	II
5	1449.49	II
2	1463.65	II
3	1473.73	II
3	1483.52	II
3	1485.95	II
3	1495.21	II
3	1504.41	II
3	1505.01	II
5	1514.57	II
3	1515.19	II
8	1535.40	II
5	1536.37	II
1	1536.91	II
3	1669.83	II
5	1695.85	II
5	1799.42	II
10	1813.98	II
15	1845.30	II
	Air	
20	2091.34	II
1	2218.04	I
1	2255.03	I
1	2259.23	I
2	2294.19	I
1	2297.87	I
3	2338.24	I
1	2338.60	I

Ga I and II		
Intensity	Wavelength	
3	2371.29	I
2	2377.53	II
4	2418.69	I
5	2438.88	II
6	2450.08	I
7	2500.19	I
3	2500.71	I
5	2513.55	II
3	2514.15	II
2	2551.26	II
3	2552.87	II
4	2555.28	II
5	2607.47	I
8	2624.82	I
10	2632.66	I
3	2659.87	I
10	2665.05	I
8	2691.29	I
20	2700.47	II
3	2719.66	I
15	2780.15	II
6	2874.24	I
1	2886.45	II
	2893.65	II
2	2910.77	II
6	2943.64	I
6	2944.17	I
3	2969.41	II
1	2971.01	II
3	2971.60	II
5	2974.77	II
1	2992.84	II
2	3011.90	II
1	3158.18	II
4	3374.94	II
1	3375.95	II
2	3436.66	II
3	3446.46	II
2	3447.26	II
5	3470.34	II
1	3471.46	II
1	3472.52	II
2	3583.60	II
1	3693.93	II
2	3705.85	II
4	3734.85	II
9	3924.39	II
10	4032.99	I
10	4172.04	I
4	4251.11	II
15	4251.16	II
10 h	4254.04	II
4 h	4255.64	II
5	4255.70	II
10	4255.77	II
40	4262.00	II
3	5218.21	II
1	5338.3	II
2	5353.49	I
2	5360.6	II
1	5363.5	II
3	5416.8	II
1	5421.6	II
1	5425.6	II
10	6334.2	II
2000	6396.56	I
1000	6413.44	I
5	6419.4	II
3	6456.3	II

Ga I and II

Intensity	Wavelength	
1	7000.0	II
3 h	7051.24	I
5 h	7106.82	I
1 h	7116.3	I
2 h	7172.9	I
5 h	7193.6	I
7	7198.7	II
10 h	7251.4	I
3 h	7289.6	I
5 h	7349.3	I
20 h	7403.0	I
30 h	7464.0	I
6 h	7556.6	I
10 h	7620.5	I
50 h	7734.77	I
2	7793.0	II
100 h	7800.01	I
4 h	7801.6	I
15 h	8002.55	I
20 h	8074.25	I
3 h	8167.5	I
5 h	8171.6	I
100 h	8311.86	I
200 h	8386.49	I
10 h	8389.30	I
7 h	8415.51	I
10 h	8419.91	I
20 h	8808.75	I
30 h	8813.56	I
20 h	8856.37	I
30 h	8944.33	I
200 h	9492.92	I
200 h	9493.12	I
300 h	9589.36	I
20 h	9594.25	I
60 h	10898.10	I
100 h	10905.95	I
10	10968.27	I
20	11103.51	I
400	11949.12	I
200	12109.78	I
40	12885.05	I
50	13057.50	I
50	14982.75	I
60	14996.64	I
20	17757.91	I
10	17868.96	I
60	22016.81	I
70	22568.71	I

Ga III

Ref. 141 - L.J.R.

Vacuum

50	620.00	III
40	622.01	III
90	806.51	III
90	817.30	III
50	828.70	III
80	1085.00	III
60	1105.61	III
90	1150.27	III
90	1267.16	III
80	1293.46	III
60	1295.36	III
60	1323.15	III
70	1353.92	III
90	1495.07	III
50	1534.46	III

Ga III

Air

90	2417.70	III
90	2423.98	III
15	2424.36	III
50	3521.77	III
80	3581.19	III
100	3589.34	III
10	3731.10	III
10	3806.60	III
100	4380.69	III
150	4381.76	III
100	4863.00	III
150	4993.78	III
10	5808.28	III
20	5848.25	III
15	5993.51	III

Ga IV

Refs. 141,143 - L.J.R.

Vacuum

14	294.53	IV
61	295.67	IV
41	304.99	IV
4	422.12	IV
25	423.18	IV
16	439.92	IV
67	1137.06	IV
70	1156.10	IV
70	1163.60	IV
75	1170.58	IV
48	1171.71	IV
68	1185.23	IV
40	1186.06	IV
73	1190.89	IV
73	1193.02	IV
75	1195.02	IV
69	1201.54	IV
72	1206.89	IV
63	1216.15	IV
50	1228.03	IV
60	1236.38	IV
60	1238.59	IV
45	1241.81	IV
75	1245.53	IV
83	1258.77	IV
81	1264.66	IV
82	1267.15	IV
81	1279.24	IV
80	1285.33	IV
82	1295.86	IV
83	1299.46	IV
82	1303.53	IV
80	1309.68	IV
80	1314.82	IV
85	1338.09	IV
77	1347.03	IV
76	1351.06	IV
74	1364.63	IV
60	1395.54	IV
77	1402.55	IV
70	1405.32	IV
73	1465.87	IV

Ga V

Refs. 2,62,140 - L.J.R.

Vacuum

5	290.53	V
1	296.13	V
5	296.82	V
30	298.44	V
20	299.47	V

Ga V

Intensity	Wavelength	
30	300.01	V
25	300.57	V
10	300.78	V
20	301.19	V
30	302.86	V
20	303.84	V
30	307.03	V
30	308.26	V
15	309.64	V
30	311.79	V
25	312.41	V
30	313.68	V
15	315.95	V
20	316.48	V
40	319.41	V
12	320.53	V
40	322.31	V
50	322.99	V
30	323.10	V
40	324.25	V
40	324.95	V
40	326.14	V
30	326.77	V
30	328.65	V
5	336.61	V
20	878.17	V
40	973.21	V
10	977.89	V
15	979.60	V
20	984.95	V
40	989.75	V
90	1014.47	V
90	1019.71	V
20	1033.55	V
30	1038.76	V
30	1047.50	V
120	1050.48	V
80	1054.56	V
90	1058.12	V
80	1066.69	V
35	1068.59	V
30	1069.45	V
60	1069.60	V
55	1071.19	V
45	1071.41	V
80	1073.77	V
90	1078.83	V
110	1079.60	V
60	1080.99	V
250	1085.01	V
80	1087.37	V
40	1090.53	V
90	1091.71	V
100	1094.36	V
80	1095.10	V
70	1101.62	V
160	1102.83	V
140	1103.03	V
60	1104.93	V
75	1105.62	V
70	1106.17	V
40	1115.55	V
80	1118.34	V
55	1123.18	V
80	1123.66	V
120	1126.40	V
80	1127.75	V
130	1128.10	V
120	1128.53	V

Ga V

Intensity	Wavelength	
100	1129.94	V
80	1131.43	V
40	1133.91	V
130	1136.07	V
65	1138.20	V
60	1144.30	V
50	1145.70	V
30	1148.42	V
45	1150.09	V
130	1150.23	V
120	1156.51	V
35	1157.74	V
25	1169.40	V
40	1178.95	V
80	1213.17	V
30	1265.45	V
30	1276.85	V
15	1283.64	V
10	1311.35	V

GERMANIUM (Ge)

Z = 32

Ge I and II

Refs. 5,119,293,340 - C.H.C.

Vacuum

1	822.97	II
3	835.08	II
10	850.50	II
10	862.234	II
15	875.493	II
15	905.977	II
20	920.554	II
50	999.101	II
100	1016.638	II
100	1075.072	II
300	1085.51	II
200	1098.71	II
500	1106.74	II
500	1120.46	II
200	1164.27	II
500	1181.19	II
500	1181.65	II
200	1188.73	II
100	1189.62	II
300	1191.26	II
50	1191.72	II
500	1237.059	II
500	1261.905	II
100	1264.710	II
100	1380.42	II
50	1392.26	II
200	1401.24	II
200	1538.091	II
500	1576.855	II
75	1581.070	II
100	1602.486	II
3 r	1615.57	I
2 r	1624.130	I
2 r	1630.173	I
3 r	1636.31	I
2	1638.96	I
4 r	1639.730	I
2	1647.531	I
200	1649.194	II
2	1651.528	I
4 r	1651.955	I

Ge I and II

Intensity	Wavelength	
3	1661.345	I
4 r	1663.539	I
10 h	1665.275	I
4	1667.802	I
3 r	1670.608	I
100 r	1691.090	I
200 r	1716.784	I
100 h	1739.102	I
100	1742.195	I
50	1746.065	I
200	1750.043	I
100	1758.279	I
100 h	1764.185	I
100 h	1765.284	I
50 h	1766.433	I
200	1774.176	I
200	1785.046	I
100 h	1793.071	I
75 h	1801.432	I
200 h	1841.328	I
200 h	1842.410	I
100 h	1844.410	I
100 h	1845.872	I
100 h	1846.958	I
200	1853.134	I
500 r	1860.086	I
100	1865.052	I
300 r	1874.256	I
100	1895.197	I
500 r	1904.702	I
50 h	1908.434	I
30	1912.409	I
300 r	1917.592	I
100 h	1923.467	I
500 r	1929.826	I
10 h	1934.048	I
100 r	1937.483	I
500	1938.008	II
100 r	1938.300	I
500	1938.891	II
30 s	1944.116	I
200	1944.731	I
200	1955.115	I
500	1962.013	I
30 h	1963.373	I
30	1965.383	I
200	1970.880	I
200	1979.274	II
300 h	1987.849	I
300	1988.267	I
500 r	1998.887	I
	Air	
50	2007.04	II
200	2011.29	I
1700	2019.068	I
2400 r	2041.712	I
1600 r	2043.770	I
420	2054.461	I
220 h	2057.238	I
750 r	2065.215	I
2600 r	2068.656	I
420	2086.021	I
2000 r	2094.258	I
240	2105.824	I
95 h	2124.744	I
50 h	2186.451	I
100	2197.62	II
340 r	2198.714	I
100	2205.85	II

Ge I and II

Intensity	Wavelength	
15	2220.375	I
18	2256.001	I
18	2314.201	I
24	2327.918	I
15	2359.233	I
20	2379.144	I
10	2389.472	I
15	2397.885	I
130	2417.367	I
30	2436.412	I
100	2478.66	II
90	2497.962	I
500	2500.54	II
70	2533.230	I
3	2556.298	I
28	2589.188	I
500	2592.534	I
8	2644.184	I
1200	2651.172	I
500	2651.568	I
500	2691.341	I
200	2704.03	II
850	2709.624	I
400	2729.78	II
40	2740.426	I
650	2754.588	I
50	2770.59	II
75	2772.35	II
70	2793.925	I
80	2829.008	I
1000	2831.843	II
50	2834.28	II
75	2839.68	II
1000	2845.527	II
75	2853.97	II
750	3039.067	I
600	3067.021	I
20	3124.816	I
50	3186.72	II
100	3221.64	II
110	3269.489	I
50	3312.56	II
75	3323.64	II
100	3455.72	II
300	3499.21	II
30	3845.11	II
70	4226.562	I
10	4685.829	I
75 h	4689.87	II
50 h	4690.02	II
1000	4741.806	II
1000	4814.608	II
50	4824.097	II
100	5131.752	II
200	5178.648	II
3	5194.583	I
6	5265.892	I
6	5513.263	I
8	5564.741	I
8	5607.010	I
6	5616.135	I
7	5621.426	I
8	5655.96	I
6	5664.226	I
5	5664.842	I
9	5691.954	I
6	5701.776	I
5	5717.877	I
6	5801.029	I

Ge I and II

Intensity	Wavelength	
9	5802.093	I
1000	5893.389	II
500	6021.041	II
150	6078.39	II
50	6267.14	II
150	6268.07	II
100	6268.34	II
75	6283.452	II
100	6336.377	II
100	6484.181	II
6	6557.488	I
50	6780.51	II
50	7049.369	II
6	7130.12	I
30	7145.390	II
7	7330.38	I
5	7353.334	I
7	7384.208	I
6	7402.64	I
7	7511.57	I
5	7776.20	I
10	7833.575	I
7	7837.63	I
6	7853.77	I
7	7878.12	I
5	7962.26	I
5	7983.33	I
10	8031.039	I
6	8044.165	I
5	8095.29	I
5	8225.22	I
7	8226.09	I
10	8256.013	I
5	8264.15	I
5	8280.09	I
6	8281.04	I
8	8367.81	I
7	8391.70	I
5	8396.36	I
5	8429.42	I
10	8482.21	I
8	8506.70	I
5	8507.66	I
8	8564.89	I
6	8599.27	I
6	8652.42	I
5	8669.60	I
9	8700.60	I
5	8712.90	I
6	8734.78	I
6	8789.88	I
5	9068.785	I
5	9095.957	I
6	9398.868	I
20	9474.993	II
20	9475.645	II
4	9492.559	I
7	9625.664	I
5	10039.436	I
4	10200.952	I
10	10382.427	I
10	10404.913	I
8	10734.068	I
8	10947.416	I
10	11125.130	I
230	11252.83	I
24	11293.40	I
33	11318.13	I
55	11459.05	I

Ge I and II

Intensity	Wavelength	
150	11483.77	I
175	11614.81	I
600	11714.76	I
10	11839.77	I
55	11917.01	I
10	12025.64	I
10	12055.49	I
30	12061.41	I
45	12065.76	I
1300	12069.20	I
30	12198.88	I
20	12207.73	I
60	12286.75	I
55	12338.76	I
1050	12391.58	I
48	12540.41	I
15	12636.80	I
150	12676.58	I
40	12681.28	I
115	12800.66	I
175	12836.38	I
12	12847.92	I
120	12955.73	I
15	13028.64	I
235	13107.61	I
20	13492.28	I
42	13534.85	I
28	13724.48	I
42	14116.70	I
42	14297.15	I
40	14569.84	I
12	14667.52	I
470	14822.38	I
16	14921.97	I
15	15001.75	I
13	15041.21	I
20	15504.34	I
14	16424.77	I
12	16626.64	I
70	16699.29	I
150	16759.79	I
135	17214.34	I
16	18428.30	I
35	18495.54	I
10	18764.11	I
70	18811.86	I
62	19279.24	I
28	20673.64	I
4	21518.30	I
9	22091.84	I
5	23921.92	I

Ge III
Ref. 341 - C.H.C.
Vacuum

2	542.90	III
2	663.77	III
3	670.88	III
2	680.28	III
2	952.76	III
12	988.96	III
15	995.72	III
10	996.50	III
15	1011.21	III
10	1012.31	III
8	1032.62	III
12	1040.99	III
12	1058.91	III
40	1088.45	III

Ge III

Intensity	Wavelength	
10	1137.92	III
12	1150.55	III
8	1159.15	III
8	1159.62	III
8	1160.79	III
10	1173.78	III
8	1212.47	III
4	1323.24	III
10	1525.32	III
2	1527.15	III
9	1600.09	III
6	1883.26	III
2	1978.22	III
	Air	
2	2019.22	III
4	2022.25	III
3	2062.14	III
15	2100.05	III
15	2102.42	III
25	2104.45	III
3	2922.86	III
25	3197.56	III
35	3211.86	III
25	3214.95	III
40	3255.05	III
20	3259.90	III
5	3369.57	III
20	3414.27	III
40	3434.03	III
8	3464.59	III
40	3489.08	III
2	3724.51	III
15	3884.78	III
200	4178.96	III
12	4245.41	III
200	4260.85	III
150	4291.71	III
10	4674.36	III
10	5016.88	III
18	5134.75	III
5	5229.37	III
3	5256.61	III

Ge IV

Ref. 341 - C.H.C.

Vacuum

1	440.11	IV
1	441.95	IV
3	847.80	IV
3	868.30	IV
8	915.00	IV
8	936.70	IV
4	938.90	IV
1	1073.44	IV
20	1188.99	IV
20	1229.81	IV
2	1494.89	IV
6	1500.61	IV
3	1648.14	IV
	Air	
2	2293.0	IV
2	2343.37	IV
15	2445.38	IV
15	2445.71	IV
30	2488.25	IV
20	2542.44	IV
5	2631.78	IV
3	2698.08	IV
15	2717.44	IV

Ge IV

Intensity	Wavelength	
30	2736.09	IV
30	2788.61	IV
5	3071.84	IV
60	3554.19	IV
50	3676.65	IV

Ge V

Ref. 342 - C.H.C.

Vacuum

700	294.51	V
1000	295.64	V
200	304.98	V
20	621.52	V
35	716.26	V
50	724.21	V
35	733.54	V
35	735.35	V
35	741.52	V
60	746.88	V
40	750.26	V
35	755.84	V
60	760.05	V
60	958.51	V
300	971.35	V
150	984.92	V
200	988.13	V
300	990.66	V
300	1004.38	V
300	1016.66	V
250	1038.40	V
900	1045.71	V
400	1050.05	V
300	1054.59	V
300	1068.43	V
400	1069.13	V
700	1072.66	V
600	1086.65	V
500	1087.85	V
800	1089.49	V
300	1092.09	V
1000	1116.94	V
300	1122.01	V
700	1163.39	V
300	1165.26	V
200	1176.69	V
700	1222.30	V

GOLD (Au)

Z = 79

Au I and II

Refs. 38,72,234 - C.H.C.

Vacuum

	925.72	II
	946.03	II
	950.39	II
20	957.78	II
3	967.94	II
3	974.47	II
2	982.24	II
	1062.67	II
8	1066.96	II
	1085.00	II
8	1090.78	II
5	1094.92	II
20	1103.31	II
3	1166.76	II
5	1210.86	II
20	1224.57	II

Au I and II

Intensity	Wavelength	
40 h	1305.34	I
25	1310.47	I
100 h	1328.37	I
3	1336.26	II
10 h	1338.37	I
10 h	1342.80	I
20	1350.09	I
20	1350.84	I
22	1351.74	I
25	1352.82	I
25	1354.14	I
30	1355.79	I
35	1357.86	I
40	1360.51	I
6	1362.33	II
20	1362.47	I
8	1363.15	II
50	1363.98	I
25	1364.15	I
10	1364.74	II
60	1368.62	I
35	1368.98	I
70	1374.82	I
50	1375.76	I
30	1378.87	I
8	1380.53	II
80	1382.75	I
50	1385.33	I
20	1389.14	I
60	1392.27	I
6	1393.80	II
50	1402.12	I
	1405.12	II
70	1407.38	I
100	1408.45	I
	1410.69	II
	1415.22	II
80	1429.19	I
50	1435.79	I
20	1436.61	II
10	1468.85	II
10	1469.17	II
10	1469.28	II
100	1481.76	I
25	1486.55	II
20	1532.82	I
20	1532.86	I
10	1562.04	II
200	1587.16	I
12	1593.41	II
70	1598.24	I
12	1611.11	II
	1616.65	II
2	1622.83	II
100	1624.34	I
2	1632.53	II
50	1639.90	I
150	1646.67	I
10	1656.99	II
100	1665.76	I
25	1673.59	II
7	1694.38	II
2	1698.65	II
200	1699.34	I
30	1700.69	II
10	1720.04	II
25	1725.75	II
45	1740.52	II
10	1749.80	II

Au I and II

Intensity	Wavelength	
35	1756.15	II
60	1783.22	II
35	1793.31	II
35	1800.58	II
25	1823.24	II
100	1879.83	I
20	1919.64	I
20	1921.64	II
45	1942.31	I
25	1951.93	I
30	1978.19	I
	Air	
25	2000.81	II
11000	2012.00	I
2600	2021.38	I
50	2044.54	II
150	2082.09	II
35	2095.13	II
20	2098.14	II
60	2110.68	II
30	2125.29	II
15	2126.63	I
20	2170.75	I
35	2188.81	II
25	2201.32	II
35	2215.63	II
45	2228.88	II
30	2231.18	II
25	2240.16	II
70	2248.56	II
80	2263.62	II
18	2263.88	II
25	2277.52	II
25	2283.30	II
25	2291.40	II
45	2304.69	II
25	2314.55	II
20	2315.75	II
25	2340.06	II
180	2352.65	I
20	2376.28	I
120	2387.75	I
2600	2427.95	I
60	2533.52	II
16	2544.19	I
45	2552.67	II
20	2589.25	I
30	2590.04	I
50	2616.40	II
20	2627.02	II
250	2641.48	I
3400	2675.95	I
20	2687.63	II
20	2688.16	II
30	2688.71	I
80	2700.89	I
1100	2748.25	I
20	2748.71	II
100	2780.82	I
30	2800.93	I
1000	2802.04	II
300	2819.79	II
100	2822.55	II
30	2823.13	II
100 h	2825.44	II
30	2833.03	II
300	2837.85	II
100	2846.92	II
100	2856.74	II

Au I and II

ntensity	Wavelength	
3	2872.36	I
300	2883.45	I
3	2886.96	I
10	2888.40	I
300	2891.96	I
100	2893.25	II
3	2905.74	I
30	2905.90	I
100	2907.04	II
300	2913.52	II
3	2914.82	I
300	2918.24	II
16	2932.19	
30	2940.67	I
100	2954.22	II
10	2973.33	I
100 h	2990.27	II
300	2994.80	II
10	3002.65	I
3	3005.85	I
10	3024.67	I
320	3029.20	I
30	3033.25	I
300	3065.42	I
10	3102.63	I
10 h	3117.01	I
100	3122.50	II
1600	3122.78	I
30	3126.86	II
30	3127.03	I
10	3164.88	I
10	3172.35	II
30	3191.76	I
100	3194.72	I
30	3200.37	I
30	3204.74	I
1	3221.86	I
30	3225.25	I
300	3230.63	I
10	3253.94	I
10 h	3265.10	I
30 h	3267.07	I
10	3271.63	I
10	3273.47	I
300	3308.30	I
300	3309.64	I
100	3320.12	I
100	3355.15	I
30 h	3368.44	I
10	3381.90	I
100 h	3391.31	I
100	3395.40	I
30 h	3440.36	I
100	3467.21	I
30	3471.61	I
30 h	3509.04	I
10	3510.82	I
3	3523.34	II
3	3545.61	I
30	3553.57	I
300	3557.36	I
10	3558.22	I
30	3565.97	I
30 h	3584.37	I
300	3586.73	I
30 h	3588.79	I
30	3598.06	I
100	3611.57	I
30 h	3614.00	I

Au I and II

Intensity	Wavelength	
30	3622.74	I
100 h	3631.31	I
10	3633.22	II
30	3634.53	I
10	3635.12	I
300	3637.90	I
3	3639.87	I
100 h	3645.02	I
10	3649.09	I
100	3650.74	I
10	3653.53	I
3	3654.69	I
10	3655.30	I
10	3656.90	I
30	3706.55	II
100	3709.62	I
10	3766.61	I
10	3770.76	I
100	3796.01	I
30	3801.92	I
30	3804.01	II
10	3821.85	I
10	3825.70	I
100	3874.73	I
30	3880.25	I
30	3889.48	I
100 h	3892.26	I
400	3897.86	I
30	3901.09	I
300	3909.38	I
100	3927.69	I
10 h	3959.10	I
30	3966.23	I
30	3976.65	I
30	3979.68	I
30	3991.37	I
3	4012.57	I
10	4016.07	II
400	4040.93	I
30	4052.79	II
700	4065.07	I
10	4076.35	II
3	4083.28	II
100	4084.10	I
30	4101.70	I
30	4128.59	I
30	4201.13	I
30 h	4227.88	I
100	4241.80	I
200	4315.11	I
30	4361.04	II
10	4420.61	II
120 h	4437.27	I
250	4488.25	I
900 h	4607.51	I
100 h	4620.56	I
1	4663.92	I
3	4663.97	I
10	4694.69	I
3	4760.17	II
500	4792.58	I
100	4811.60	I
10	4822.96	I
30 h	4950.82	I
30	5064.59	I
30 h	5108.84	I
100	5147.44	I
300	5230.26	I
100 h	5261.76	I

Au I and II

Intensity	Wavelength	
100	5655.77	I
100 h	5721.36	I
300	5837.37	I
100 h	5862.93	I
300 h	5956.96	I
30 h	5962.68	I
600	6278.17	I
100	6562.68	I
30	6652.89	I
600	7510.73	I
10	8145.06	I
10	9254.28	I

Au III

Refs. 72,393,395 - R.D.C. Vacuum

30	779.73	III
30	788.78	III
50	799.93	III
40	811.83	III
50	817.95	III
40	820.06	III
80	833.16	III
100	843.44	III
100	845.14	III
80	855.49	III
80	859.90	III
80	863.42	III
80	901.03	III
80	910.45	III
80	924.02	III
200	945.10	III
100	1040.63	III
80	1044.49	III
80	1046.81	III
100 h	1239.96	III
100	1278.51	III
100	1314.84	III
200	1336.72	III
180	1341.68	III
100	1348.89	III
150	1350.32	III
150	1355.61	III
150	1356.13	III
80	1362.06	III
500	1365.40	III
200	1367.17	III
180	1377.73	III
150	1378.69	III
150	1379.98	III
125	1380.53	III
200	1381.36	III
300	1385.79	III
100	1389.41	III
180	1391.46	III
180	1396.00	III
100	1402.91	III
225	1409.50	III
250	1413.80	III
100	1414.27	III
80	1415.54	III
100	1417.09	III
125	1417.39	III
150	1427.42	III
300	1428.93	III
250	1430.06	III
275	1433.37	III
250	1435.81	III
80	1436.12	III

Au III

Intensity	Wavelength	
300	1439.12	III
200	1441.21	III
150	1446.37	III
80	1446.69	III
250	1448.42	III
250	1454.95	III
100	1464.72	III
150	1471.28	III
80	1473.32	III
100	1474.73	III
150	1481.10	III
300	1487.15	III
250	1487.91	III
200	1489.47	III
250	1500.37	III
200	1502.47	III
200	1503.74	III
80	1540.26	III
100	1542.00	III
80	1542.25	III
100	1548.50	III
80	1554.61	III
80	1562.33	III
80	1562.41	III
200	1567.54	III
80	1571.94	III
200	1574.85	III
200	1579.44	III
150	1584.10	III
200	1589.56	III
80	1589.68	III
150	1593.41	III
200	1600.51	III
250	1617.16	III
100	1617.78	III
500	1621.93	III
300 d	1629.13	III
250	1638.88	III
100	1644.17	III
250	1652.74	III
250	1664.77	III
100	1668.11	III
125	1673.93	III
1000	1693.94	III
150	1697.09	III
200	1698.98	III
200	1700.00	III
200	1702.25	III
100	1707.53	III
250	1710.16	III
200	1715.69	III
100	1716.71	III
300	1717.83	III
500	1727.31	III
100 d	1733.17	III
300	1738.48	III
150	1744.39	III
500	1746.10	III
500	1756.92	III
500	1761.95	III
300	1767.42	III
100	1774.42	III
800	1775.17	III
200	1776.40	III
100	1780.57	III
300	1786.11	III
150	1792.65	III
500	1793.76	III
200	1801.98	III

Au III		
Intensity	Wavelength	
400	1805.24	III
100	1809.81	III
400	1821.17	III
400	1844.89	III
150	1848.83	III
80	1850.15	III
500	1861.80	III
150	1871.92	III
150	1918.28	III
100	1932.04	III
100	1935.42	III
200	1948.79	III
100	1958.47	III
400	1989.63	III
150	1996.85	III
	Air	
300	2083.09	III
80	2085.45	III
100	2159.08	III
80	2167.33	III
200	2172.20	III
100	2184.11	III
500	2188.97	III
300	2322.27	III
100	2382.40	III
150	2402.71	III
150	2405.12	III
100	3227.99	III
100	3309.86	III

HAFNIUM (Hf)

Z = 72

Hf I and II Ref. 1 – C.H.C. Air		
6200	2012.78	II
8500	2028.18	II
1200	2096.18	II
540	2210.82	II
320	2254.01	II
160	2255.15	II
250	2266.83	II
620	2277.16	II
230	2321.14	II
580	2322.47	II
300	2323.25	II
120	2324.50	II
300	2324.89	II
200	2332.97	II
200	2337.33	II
230	2343.32	II
320	2347.44	II
540	2351.22	II
110	2353.02	I
90	2365.98	II
250	2380.30	II
100	2381.00	II
170	2393.18	II
450	2393.36	II
670	2393.83	II
130	2400.78	II
70	2404.56	II
540	2405.42	II
130	2406.44	II
370	2410.14	II
90	2413.33	II
55	2415.96	II

Hf I and II		
Intensity	Wavelength	
320	2417.69	II
120	2425.98	II
45	2428.75	I
120	2428.99	II
130	2433.57	II
45	2434.74	II
35	2444.99	I
390	2447.25	II
140	2449.44	II
35	2452.30	II
110	2453.34	II
450	2460.49	II
70	2463.97	II
430	2464.19	II
90	2465.06	II
35	2465.67	I
140	2467.97	II
210	2469.18	II
100	2473.92	II
55	2481.44	II
55	2482.65	I
55	2487.16	I
290	2496.99	II
580	2512.69	II
580	2513.03	II
130	2515.48	II
890	2516.88	II
340	2531.19	II
200	2537.33	II
110	2548.20	II
320	2551.40	II
130	2559.19	II
250	2563.61	II
890	2571.67	II
320	2573.90	II
320	2576.82	II
300	2578.14	II
320	2582.54	II
130	2591.33	II
390	2606.37	II
450	2607.03	II
120	2608.45	I
230	2613.60	II
450	2622.74	II
160	2637.00	I
1100	2638.71	II
1100	2641.41	II
160	2642.75	I
670	2647.29	II
100	2651.16	II
160	2657.84	II
210	2661.88	II
290	2683.35	II
670	2705.61	I
110	2706.73	II
210	2712.42	II
140	2713.84	I
250	2718.59	I
120	2730.85	I
710	2738.76	II
200	2743.64	I
360	2751.81	II
450	2761.63	I
160	2766.96	I
170	2773.02	I
980	2773.36	II
180	2774.02	II
390	2779.37	I
100	2789.50	II

Hf I and II		
Intensity	Wavelength	
140	2789.73	II
230	2808.00	II
230	2813.86	II
170	2814.48	II
230	2817.68	I
140	2818.94	I
200	2819.74	I
1200	2820.22	II
490	2822.68	II
180	2833.28	I
110	2834.13	I
410	2845.83	I
270	2849.21	II
270	2850.96	I
180	2851.21	II
180	2860.56	I
760	2861.01	II
760	2861.70	II
2100	2866.37	I
130	2869.82	II
150	2876.33	II
210	2887.14	I
100	2887.54	I
800	2889.62	I
1800	2898.26	I
130	2898.71	II
1200	2904.41	I
890	2904.75	I
140	2909.91	II
2000	2916.48	I
580	2918.58	I
320	2919.59	II
180	2924.62	I
490	2929.63	II
450	2929.90	I
710	2937.80	II
2000	2940.77	I
160	2944.71	I
1200	2950.68	I
1100	2954.20	I
540	2958.02	I
120	2961.80	II
1400	2964.88	I
620	2966.93	I
140	2967.23	II
710	2968.81	II
110	2973.37	I
890	2975.88	II
150	2979.28	I
1100	2980.81	I
210	2982.72	I
170	3000.10	II
800	3005.56	I
1100	3012.90	II
540	3016.78	I
1100	3016.94	II
980	3018.31	I
1200	3020.53	I
140	3025.29	II
410	3031.16	II
110	3046.08	II
710	3050.76	I
1100	3057.02	I
130	3063.78	I
130	3064.68	II
850	3067.41	I
2100	3072.88	I
170	3074.10	I
250	3074.79	I

Hf I and II		
Intensity	Wavelength	
150	3080.66	II
430	3080.84	I
200	3096.76	I
340	3101.40	II
710	3109.12	II
130	3110.87	II
130	3119.98	I
710	3131.81	I
850	3134.72	II
130	3137.51	I
170	3139.65	II
120	3140.76	II
220	3145.32	II
220	3148.41	I
120	3151.63	I
450	3156.63	I
270	3159.82	I
710	3162.61	II
450	3168.39	I
890	3172.94	I
450	3176.86	II
220	3181.01	I
120	3181.15	I
130	3189.62	I
360	3193.53	II
670	3194.19	II
200	3196.93	I
130	3199.99	II
310	3206.11	I
180	3210.98	I
180	3217.30	II
180	3220.61	II
130	3230.06	I
130	3239.44	I
130	3243.35	I
360	3247.66	I
220	3249.53	I
890	3253.70	II
270	3255.28	II
120	3262.47	I
180	3273.66	II
270	3279.98	II
160	3291.05	I
210	3306.12	I
120	3309.19	I
340	3310.27	I
670	3312.86	I
180	3317.99	II
130	3328.21	II
890	3332.73	I
370	3352.06	II
130	3356.78	I
230	3358.91	I
180	3360.06	I
140	3366.68	I
180	3378.93	I
140	3384.14	II
230	3384.70	II
170	3386.21	I
800	3389.83	II
230	3392.81	I
230	3394.59	II
140	3394.98	II
230	3397.26	I
230	3397.60	I
2300	3399.80	II
170	3400.21	I
180	3402.51	I
140	3407.76	II

Hf I and II			Hf I and II			Hf I and II			Hf I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
230	3410.17	II	100	3765.56	I	110	4367.90	II	19	5650.83	I
230	3417.34	I	170	3766.92	II	180	4370.97	II	40bl	5698.03	HfO
410	3419.18	I	200	3768.25	I	120	4417.35	II	25	5713.28	I
140	3427.44	I	1400	3777.64	I	160	4417.91	I	160	5719.18	I
200	3428.37	II	1400	3785.46	I	200	4438.04	I	25bl	5720.16	HfO
250	3438.24	II	650	3793.37	II	140	4457.34	I	12	5748.72	I
140	3438.43	I	100	3798.66	I	140	4461.18	I	14	5767.18	II
100	3441.84	I	850 d	3800.38	I	140	4540.93	I	12	5809.50	II
100	3452.31	I	140	3806.07	II	250	4565.94	I	19	5817.47	I
140	3462.64	II	320	3811.78	I	500 d	4598.80	I	25	5842.23	II
140	3467.60	I	100	3817.20	II	230	4620.86	I	25	5845.87	I
710	3472.40	I	100	3819.38	I	210	4655.19	I	19	5847.77	I
200	3478.99	II	1300	3820.73	I	120	4699.01	I	22	5883.66	I
480	3479.28	II	140	3829.67	I	160	4782.74	I	15	5926.47	I
250	3495.75	II	280	3830.02	I	310	4800.50	I	60	5933.69	I
250	3497.16	I	800	3849.18	I	130	4859.24	I	75	5974.28	I
980	3497.49	I	140	3849.52	II	120	4975.25	I	25	5974.72	I
100	3498.98	I	600	3858.31	I	95	5018.20	I	60	5978.66	I
1200	3505.23	II	230	3860.91	I	15	5021.75	I	25	5992.96	I
150	3513.28	I	200	3872.55	II	55	5040.82	II	45 c	6016.79	I
130	3518.75	II	160	3877.10	II	95	5047.45	I	28 b	6021.12	HfO
980	3523.02	I	380	3880.82	II	55 b	5074.74	HfO	25 b	6043.19	HfO
100	3530.87	I	200	3882.52	I	30	5079.65	II	25	6054.17	I
100	3531.23	I	150	3883.77	II	55 b	5093.88	HfO	95	6098.67	I
980	3535.54	II	200	3889.23	I	15	5112.13	I	95	6185.13	I
760	3536.62	I	200	3889.33	I	19	5128.53	II	55	6210.70	I
180	3548.81	I	620	3899.94	I	30	5157.96	I	28	6216.82	I
540	3552.70	II	620	3918.09	II	55	5167.42	I	45	6238.58	I
150	3554.00	I	200	3923.90	II	75	5170.18	I	60	6248.95	II
1300	3561.66	II	120	3926.42	I	230	5181.86	I	22 h	6299.54	I
150	3564.31	I	150	3927.57	I	30	5186.84	I	25 h	6311.85	I
270	3567.36	I	110	3929.54	II	30	5187.75	II	19	6318.33	I
1100	3569.04	II	320	3931.38	I	110	5243.99	I	30	6338.10	I
150	3579.90	I	120	3935.65	II	55	5247.10	II	19 h	6380.19	I
110	3583.28	I	120	3939.04	I	25	5260.44	II	60	6386.23	I
210	3597.42	II	410	3951.83	I	30	5264.95	II	19 h	6409.52	I
540	3599.87	I	160	3968.01	I	55	5275.04	I	15 h	6556.50	I
110	3615.04	I	150bl	3970.05	HfO	22	5286.09	I	28	6587.23	I
800	3616.89	I	200	3973.48	I	120	5294.87	I	45	6644.60	II
110	3617.68	I	180	4032.27	I	45	5298.06	II	19	6647.06	II
110	3624.00	II	100	4047.96	II	30	5307.82	I	11	6659.40	I
320	3630.87	II	230	4062.84	I	45	5309.68	I	30	6713.48	I
100	3635.43	I	140	4066.21	I	55	5311.60	II	17	6754.61	II
800	3644.36	II	180	4083.35	I	12	5324.26	II	11	6769.95	I
320	3649.10	I	540	4093.16	II	9	5346.30	II	85	6789.27	I
200	3651.84	I	110	4104.23	I	110	5354.73	I	160	6818.94	I
140	3661.05	II	140	4106.58	I	110	5373.86	I	15	6826.56	I
220	3665.35	II	110	4113.53	II	40	5389.34	I	13	6850.07	I
100	3668.21	I	110	4118.60	I	19	5391.36	II	35	6858.70	I
200	3672.27	I	150	4127.80	II	19	5404.47	I	45	6911.40	I
480	3675.74	I	140	4145.76	I	28	5424.02	I	10	6926.19	I
2200	3682.24	I	150	4162.36	II	12	5435.78	I	19	6979.59	I
280	3696.51	I	110	4162.69	I	40	5438.74	I	21	6980.91	II
100	3698.40	II	1100	4174.34	I	14	5444.07	II	7	7019.25	I
240	3699.72	II	120	4190.95	I	75	5452.92	I	7	7030.33	II
340	3701.15	II	160	4206.58	II	30	5463.38	II	7	7035.13	I
100	3704.92	I	190	4209.70	I	15	5497.30	I	11	7061.90	I
120	3705.40	II	170	4228.08	I	15	5510.12	I	15	7062.87	I
1000	3717.80	I	170	4232.44	II	15	5510.45	I	160	7063.83	I
650	3719.28	II	120bl	4252.08	HfO	19	5524.35	II	11 h	7094.40	I
140	3726.49	I	170	4260.98	I	45	5538.02	I	15	7100.54	I
160	3729.10	I	200	4263.39	I	28	5538.26	I	55	7119.52	I
460	3733.79	I	170	4272.85	II	230	5550.60	I	570	7131.81	I
160	3737.88	II	320	4294.79	I	230	5552.12	I	650	7237.10	I
120	3739.04	I	120	4318.14	I	55	5575.86	I	410	7240.87	I
100	3744.98	II	160	4330.27	I	14	5600.77	I	6	7262.62	I
400	3746.80	I	180	4336.66	II	95	5613.27	I	75	7320.05	I
140	3753.22	I	150	4350.51	II	25	5614.01	I	16	7321.76	I
100	3765.05	I	250	4356.33	I	8	5628.27	I	6	7356.10	I

Hf I and II

Intensity	Wavelength	
6	7365.28	I
20	7390.70	I
6	7423.69	I
25	7437.56	I
13	7463.86	I
7	7484.56	I
15	7556.37	I
75	7562.93	I
15	7564.22	I
11	7576.95	I
11	7592.96	I
13	7608.59	I
360	7624.40	I
20	7645.64	I
110	7740.17	I
8	7743.57	I
5	7757.89	II
40	7790.90	I
7	7796.81	I
35	7814.55	I
310	7845.35	I
7	7846.56	I
130	7920.71	I
29	7938.06	I
250	7994.73	I
7	8010.58	I
25	8056.52	I
25	8080.32	I
16	8173.89	I
130	8204.58	I
7	8248.81	I
55	8276.95	I
13	8305.91	II
25	8344.25	I
5	8380.06	I
5	8382.98	I
35	8460.01	I
150	8546.48	I
160	8640.06	I
40	8711.24	I
65	9004.73	I

Hf III

Ref. 404 - R.L.K.

Intensity	Wavelength	
	Vacuum	
20	1449.83	III
30	1507.82	III
50	1683.95	III
50	1756.91	III
60	1843.64	III
60	1870.58	III
50	1874.81	III
150	1885.15	III
100	1991.44	III
	Air	
100	2037.76	III
300	2070.94	III
150 h	2085.33	III
200 h	2099.30	III
200 h	2110.31	III
100 h	2119.69	III
200	2155.66	III
200	2183.50	III
200	2195.44	III
100	2213.54	III
200	2234.59	III
200 h	2313.44	III
300	2336.47	III
150 h	2355.48	III

Hf III

Intensity	Wavelength	
100	2373.30	III
120	2377.57	III
250	2383.540	III
400	2461.74	III
2000	2495.16	III
1000	2515.16	III
100	2534.33	III
400 h	2560.74	III
300 h	2567.46	III
200	2687.22	III
500	2753.60	III
100 h	3060.08	III
200 h	3279.67	III
100 h	3741.94	III

Hf IV

Refs. 369,425 - R.L.K.

	Vacuum	
40	520.04	IV
50	569.19	IV
100	596.56	IV
100	600.90	IV
100	603.16	IV
200	618.27	IV
100	620.19	IV
100	633.58	IV
100	643.05	IV
200	644.54	IV
400	647.39	IV
600	665.65	IV
100	671.36	IV
200	673.49	IV
15	1305.24	IV
12	1357.40	IV
40	1390.39	IV
50	1491.67	IV
35	1528.82	IV
15	1560.18	IV
25	1572.03	IV
100	1717.21	IV
20	1718.57	IV
	Air	
100	2054.46	IV
7	2014.06	IV
20	7751.29	IV
10	7267.58	IV

Hf V

Ref. 410 - R.L.K.

	Vacuum	
220	545.41	V
180	600.00	V
100	816.81	V
100	830.69	V
100	836.74	V
100	846.87	V
100	856.32	V
100	861.80	V
135	865.16	V
270	867.25	V
180	875.88	V
135	877.87	V
135	880.37	V
100	880.85	V
180	885.58	V
135	885.80	V
135	894.24	V
100	894.41	V
180	896.14	V
100	896.47	V

Hf V

Intensity	Wavelength	
135	899.70	V
180	901.54	V
135	901.92	V
135	904.95	V
135	909.70	V
135	913.68	V
135	918.48	V
180	919.10	V
270	921.67	V
135	928.01	V
135	931.50	V
135	947.12	V
245	951.62	V
180	960.12	V
180	964.74	V
160	971.51	V
135	974.62	V
120	984.64	V
135	991.50	V
100	1078.42	V
100	1079.92	V
160	1092.76	V
135	1097.28	V
135	1137.49	V
160	1201.76	V
135	1208.88	V
135	1224.62	V
135	1227.98	V
135	1230.21	V
270	1232.03	V
200	1233.59	V
160	1237.42	V
100	1238.85	V
160	1239.53	V
160	1244.46	V
100	1259.25	V
440	1396.66	V
270	1400.09	V
160	1401.70	V
135	1405.77	V
370	1407.17	V
370	1408.38	V
270	1412.28	V
270	1413.51	V
160	1421.96	V
220	1422.53	V
370	1433.43	V
370	1437.27	V
500	1437.73	V
370	1445.40	V
270	1457.91	V
270	1719.32	V
550	1729.08	V
750	1731.83	V
750	1733.96	V
440	1741.74	V
1000	1749.11	V
1000	1750.19	V
500	1760.89	V
370	1765.62	V
270	1774.02	V
135	1792.39	V

HELIUM (He)

Z = 2

He I and II

Refs. 16,94,173,183,317 - W.C.M.

He I and II

Intensity	Wavelength	
	Vacuum	
15	231.454	II
20	232.584	II
30	234.347	II
50	237.331	II
100	243.027	II
300	256.317	II
1000	303.780	II
500	303.786	II
10	320.293	I
2	505.500	I
3	505.684	I
4	505.912	I
5	506.200	I
7	506.570	I
10	507.058	I
15	507.718	I
20	508.643	I
25	509.998	I
35	512.098	I
50	515.616	I
100	522.213	I
400	537.030	I
1000	584.334	I
50	591.412	I
5	958.70	II
6	972.11	II
8	992.36	II
15	1025.27	II
30	1084.94	II
35	1215.09	II
50	1215.17	II
120	1640.34	II
180	1640.47	II
	Air	
7	2385.40	II
9	2511.20	II
50	2577.6	I
1	2723.19	I
12	2733.30	II
2	2763.80	I
10	2818.2	I
4	2829.08	I
10	2945.11	I
40	3013.7	I
20	3187.74	I
3	3202.96	II
15	3203.10	II
1	3354.55	I
2	3447.59	I
1	3587.27	I
3	3613.64	I
2	3634.23	I
3	3705.00	I
1	3732.86	I
10	3819.607	I
1	3819.76	I
500	3888.65	I
20	3964.729	I
1	4009.27	I
50	4026.191	I
5	4026.36	I
12	4120.82	I
2	4120.99	I
3	4143.76	I
10	4387.929	I
3	4437.55	I
200	4471.479	I

He I and II		
Intensity	Wavelength	
25	4471.68	I
6	4685.4	II
30	4685.7	II
30	4713.146	I
4	4713.38	I
20	4921.931	I
100	5015.678	I
10	5047.74	I
5	5411.52	II
500	5875.62	I
100	5875.97	I
8	6560.10	II
100	6678.15	I
3	6867.48	I
200	7065.19	I
30	7065.71	I
50	7281.35	I
1	7816.15	I
2	8361.69	I
2	9063.27	I
2	9210.34	I
10	9463.61	I
4	9516.60	I
3	9526.17	I
1	9529.27	I
1	9603.42	I
3	9702.60	I
6	10027.73	I
2	10031.16	I
15	10123.6	II
1	10138.50	I
10	10311.23	I
2	10311.54	I
3	10667.65	I
300	10829.09	I
1000	10830.25	I
2000	10830.34	I
9	10913.05	I
3	10917.10	I
4	11626.4	II
30	11969.12	I
20	12527.52	I
50	12784.99	I
20	12790.57	I
7	12845.96	I
10	12968.45	I
2	12984.89	I
12	15083.64	I
200	17002.47	I
1	18555.55	I
6	18636.8	II
500	18685.34	I
200	18697.23	I
100	19089.38	I
20	19543.08	I
1000	20581.30	I
80	21120.07	I
10	21121.43	I
20	21132.03	I
3	30908.5	II
4	40478.90	I

HOLMIUM (Ho)

Z = 67

Ho I and II
Ref. 1 - C.H.C.
Air

Ho I and II		
Intensity	Wavelength	
170	2502.91	II
80	2508.53	II
110	2513.55	II
95	2518.73	II
170	2533.80	I
130	2536.86	II
80	2556.84	I
80	2567.73	II
80	2586.52	I
60	2591.05	II
95	2592.99	I
190	2605.86	II
110	2610.51	II
95	2613.99	II
60	2625.20	II
80	2640.09	I
80	2640.30	II
60	2649.68	II
80	2666.24	II
70	2689.03	II
210	2713.65	II
230	2733.95	II
270	2750.35	II
110 c	2759.35	II
110	2766.85	II
270	2769.89	II
110	2772.83	II
140	2777.10	II
140	2794.41	II
100	2799.99	II
100	2806.72	II
160 c	2809.99	II
220	2811.36	II
180	2812.00	II
190	2814.74	II
300	2824.20	II
140	2826.64	II
270 c	2831.69	II
210	2834.99	II
110	2835.85	II
110	2844.18	II
100	2844.68	II
270	2849.10	II
100	2861.23	II
250	2861.49	II
150	2862.72	II
210	2871.99	II
230	2874.06	II
160	2874.43	II
360	2880.26	II
460	2880.98	II
340	2894.99	II
160	2895.62	II
170	2900.84	II
570 c	2909.41	II
170	2915.82	II
300	2919.62	II
110	2925.35	II
160	2926.09	II
300 c	2928.30	II
220	2942.05	II
300	2944.49	II
250 c	2953.11	II
390	2973.00	II
410 c	2979.63	II
180	2981.46	II
140	2985.48	II
410	2987.64	II
250	2990.27	II

Ho I and II		
Intensity	Wavelength	
110	2995.86	II
320 c	3008.10	II
220	3014.60	II
270	3038.69	II
480 c	3049.38	II
410 c	3054.00	II
500 c	3057.45	II
230	3074.30	II
500 c	3082.34	II
910	3084.36	II
430 c	3086.54	II
200	3108.31	II
200 c	3109.91	II
760	3118.50	II
300 c	3130.99	II
200 c	3134.39	II
300 c	3144.36	II
200	3156.18	II
270	3156.97	II
200 c	3159.67	II
580 c	3166.62	II
390dl	3171.72	II
810	3173.78	II
390	3174.84	II
270 c	3176.97	II
810 c	3181.50	II
390	3183.84	II
270cw	3184.48	II
200	3186.37	I
390 c	3197.83	II
390	3201.76	II
200	3206.86	II
270 c	3210.41	II
200 c	3221.42	II
320	3233.34	II
200	3236.90	II
200	3237.40	II
200 c	3257.45	II
390 c	3278.15	II
270	3279.25	II
980 c	3281.97	II
390	3288.46	II
270 c	3290.96	II
200 c	3305.16	II
200	3319.87	II
230	3320.25	II
200	3331.93	II
630 c	3337.23	II
390 c	3338.86	II
980 c	3343.58	II
200	3344.47	II
360	3350.49	II
320	3352.10	II
320cw	3353.55	II
320	3354.58	II
320	3357.91	II
320	3364.27	II
290	3370.87	II
230	3374.16	II
290 c	3390.75	II
320 c	3394.60	II
8100 c	3398.98	II
810 c	3410.26	II
1200	3421.63	II
3200	3453.14	II
390 c	3410.65	II
1400 c	3414.90	II
5400	3416.46	II
2000 c	3425.34	II

Ho I and II		
Intensity	Wavelength	
2000 c	3428.13	II
630 c	3429.18	II
320 c	3432.10	II
390	3449.35	I
810 c	3455.70	II
16000 c	3456.00	II
1600	3461.97	II
360 c	3467.07	II
810 c	3473.91	II
5400 c	3474.26	II
6300	3484.84	II
490	3489.58	II
580 c	3493.09	II
2500 c	3494.76	II
810 c	3498.88	II
410 c	3506.95	II
320	3509.37	II
810	3510.73	I
4100 c	3515.59	II
410 c	3519.94	II
630	3540.76	II
1600	3546.05	II
1100 c	3556.78	II
410	3560.15	II
410 c	3573.24	II
630 c	3574.80	II
810	3579.12	I
410	3580.75	II
410	3581.83	II
630 c	3592.23	II
1100cw	3598.77	II
340	3599.48	I
540 c	3600.95	II
340	3613.31	II
410	3618.43	I
430 c	3626.69	II
490	3627.25	II
430 c	3631.76	II
430 c	3638.30	II
1600 c	3662.29	I
430	3662.99	I
720	3666.65	I
1400	3667.97	I
320	3669.05	II
450	3669.52	I
450 c	3674.77	II
720	3679.19	I
670	3679.70	I
720	3682.65	I
430	3685.16	II
580	3690.65	I
340	3691.95	I
410	3700.04	I
490 c	3702.35	II
320	3709.76	I
430	3712.88	I
450	3720.72	I
1100	3731.40	I
360	3732.09	I
810	3736.35	I
3200cw	3748.17	II
320 c	3753.73	II
340	3769.09	I
320	3788.08	II
8900 c	3796.75	II
8900 c	3810.73	II
490	3811.86	I
900 c	3813.25	II
300	3821.73	II

Ho I and II			Ho I and II			Ho I and II			Ho I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
390	3829.27	I	200	4087.59	I	130 c	4661.33	II	65	5251.82	I
320cw	3831.9	II	140	4091.64	I	140 c	4674.62	II	55	5275.48	I
410 c	3835.35	II	120	4094.78	I	70	4701.17	II	90	5301.25	I
1300cw	3837.51	II	230	4100.22	I	80	4701.69	II	35	5319.24	I
410 c	3842.05	II	8900	4103.84	I	130	4709.84	II	35	5319.65	I
1100	3843.86	II	120	4105.04	I	65	4711.39	I	80	5330.11	I
490 c	3846.73	II	270	4106.50	I	130 c	4717.52	I	90	5359.99	I
300	3849.88	I	100	4107.36	I	35 c	4728.72	II	55	5381.40	I
320	3852.40	II	2900	4108.62	I	35	4738.00	II	30	5384.56	I
1800 c	3854.07	II	300	4112.00	I	290	4742.04	II	30	5384.97	I
390cw	3856.94	II	100	4112.72	I	35 c	4749.09	II	18 h	5393.85	I
720	3857.72	II	270	4116.73	I	35	4751.40	I	70	5403.17	I
2700 c	3861.68	II	1500	4120.20	I	100 c	4757.01	I	100	5407.08	I
540	3862.62	I	1300	4125.65	I	35	4762.39	II	14	5413.62	II
360	3872.05	II	4300	4127.16	I	35	4763.57	II	16	5434.39	II
320 c	3874.09	II	300	4134.54	I	55	4777.48	II	18	5435.87	I
630	3874.68	II	1500	4136.22	I	30	4779.42	I	30	5445.39	I
540	3881.61	II	130	4139.34	I	70 c	4781.19	I	18	5449.8	II
3000 c	3888.96	II	230	4142.19	I	65	4782.92	I	30 h	5451.90	I
490	3890.42	I	290	4148.97	I	55 c	4786.29	I	14	5454.0	II
13000 c	3891.02	II	980cw	4152.61	II	35	4791.48	II	30 c	5498.57	I
540	3896.76	II	8100	4163.03	I	35	4795.92	II	30	5504.51	I
290	3902.23	II	160	4172.23	I	45 h	4798.87	I	27	5515.56	II
320	3904.44	I	2500	4173.23	I	27	4812.92	II	18	5516.45	II
1300cw	3905.68	II	540	4194.35	I	55	4832.31	II	30	5534.33	I
320	3911.80	I	100	4198.08	I	30	4833.32	I	27	5553.14	I
320	3919.45	I	130	4203.21	I	30	4855.54	II	35 c	5560.94	I
320 c	3936.44	II	100	4211.30	II	45	4860.39	I	35 b	5563.6	HoO
220	3938.85	I	290	4222.29	I	27 c	4889.67	II	70	5566.52	I
320cw	3940.53	II	290	4223.47	I	30	4892.35	I	18	5573.96	II
220	3950.56	I	2000	4227.04	I	35	4896.44	II	35bl	5584.7	HoO
580	3955.73	I	390	4229.52	II	55	4906.99	II	55 b	5591.1	HoO
230 c	3959.51	II	130 h	4231.24	I	45	4922.73	I	55bl	5592.3	HoO
490	3959.68	I	290	4243.78	I	55 c	4934.89	I	30 b	5607.1	HoO
220	3975.88	I	1300cw	4254.43	I	290	4939.01	I	27	5613.64	I
390 c	3976.93	I	130 c	4258.61	II	27 c	4946.80	I	45 b	5626.4	HoO
220cw	3985.71	II	490	4264.05	I	45	4948.18	II	65	5627.60	I
220	3993.73	II	300	4266.04	I	65 c	4959.42	II	30	5628.24	II
380	3999.58	I	100	4273.63	II	35	4961.03	II	55	5640.62	I
160cw	4002.59	II	200	4311.04	I	55cw	4966.73	II	70bs	5655.9	HoO
220	4003.39	I	250	4330.64	II	250 c	4967.21	II	65 b	5658.9	HoO
110	4013.50	I	300	4337.13	II	220	4979.97	I	140	5659.58	I
320	4014.20	II	100cw	4346.84	II	35 c	4988.96	I	70 c	5671.84	
160 c	4018.09	II	1300	4350.73	I	90	4995.05	I	65	5674.70	I
160 c	4022.76	II	290	4356.73	II	35 c	5012.42	I	140 c	5691.47	I
160 c	4023.94	II	140	4363.93	II	55	5013.28	II	70bs	5696.3	HoO
110	4025.39	I	170	4379.14	II	65	5026.53	I	140 c	5696.57	I
320	4027.21	I	180 c	4384.83	II	30	5028.17	I	27	5734.02	I
270	4028.86	I	150	4400.55	II	55	5032.95	II	45	5736.4	HoO
180 c	4031.80	I	120	4401.24	II	65 c	5037.60	I	55	5739.24	I
220	4037.62	I	180	4403.27	I	130	5042.37	I	22	5749.58	I
220 c	4038.87	II	200	4420.56	II	35	5044.73	I	30	5766.64	
2700	4040.81	I	130	4444.63	I	30	5051.44	II	27 b	5803.8	HoO
5400 c	4045.44	II	100	4473.59	II	30	5054.92	II	45 b	5819.2	HoO
220 c	4047.52	I	300	4477.64	II	35 c	5060.75	I	27 h	5821.90	I
8100	4053.93	I	120	4484.57	II	65	5074.34	I	22	5839.47	I
540	4054.48	II	140	4510.82	I	80	5093.07	I	45 b	5849.4	HoO
270	4057.55	I	100 c	4526.14	II	140	5127.81	I	140 c	5860.28	I
220	4060.31	I	170	4530.08	II	55	5129.27	II	27 h	5864.42	I
1700	4065.09	II	170 c	4531.28	I	130	5142.59	II	45	5870.85	I
170	4067.57	I	130 c	4531.65	II	110	5143.22	II	27 b	5879.6	HoO
720	4068.05	I	170	4534.58	I	160	5149.59	II	70 c	5882.99	I
270	4071.83	I	200	4562.52	I	90 c	5167.88	I	35 c	5892.56	I
270	4073.13	I	120cw	4609.32	II	130 c	5182.11	I	22	5904.29	I
290	4073.51	I	130	4613.37	I	55	5187.85	I	70	5921.76	I
120 c	4080.23	II	100	4618.84	I	90	5190.11	II	30 c	5933.71	I
230	4083.67	I	100 c	4628.22	I	18	5195.23	I	70cw	5948.03	I
140	4085.09	I	290	4629.10	II	45	5221.54	I	45	5955.98	I
170	4087.35	I	200 c	4649.77	II	35 c	5244.47	I	70	5972.76	I

Ho I and II

Intensity	Wavelength	
90	5973.52	I
22	5981.43	I
230 c	5982.90	I
55	6002.04	I
27	6005.33	I
35	6021.43	I
16	6038.97	I
27	6050.71	I
45	6060.31	I
120	6081.79	I
70cw	6133.60	I
35	6156.38	I
27	6156.58	I
55	6191.68	I
70	6208.65	I
18	6234.17	I
45 c	6255.75	I
70 c	6305.36	I
22	6306.68	I
30	6321.94	
30 c	6354.35	I
30 c	6372.59	I
14 h	6373.86	I
22 h	6413.41	I
27 c	6471.77	I
13	6479.17	I
11	6515.30	I
11 h	6538.99	I
70	6550.97	I
15	6560.08	I
35 d	6600.58	I
260	6604.94	I
55	6607.47	I
13	6628.35	I
120	6628.99	I
15	6632.24	I
9 h	6652.98	I
15	6662.52	I
19 c	6680.46	I
24 c	6681.62	I
15 h	6682.02	
55cw	6694.32	I
15cw	6722.34	I
40	6745.05	I
13	6766.74	I
28 c	6774.68	I
55 c	6785.43	I
13	6793.7	I
13cw	6811.04	I
15cw	6820.38	I
24	6821.64	I
17 c	6825.72	I
8 h	6826.62	
8 h	6852.97	
17cw	6865.85	I
9	6883.36	I
13	6888.50	I
15 c	6892.96	I
17	6897.95	I
15 h	6903.80	I
15cw	6913.47	I
9	6916.70	I
40cw	6939.49	I
45cw	6950.39	I
13hl	6955.3	I
19	6976.7	II
10	6985.11	
9	6994.38	
14 h	7000.71	

Ho I and II

Intensity	Wavelength	
10	7079.07	
12	7098.58	
9	7242.08	I
9	7250.60	I
14	7308.55	
25	7341.43	
18	7389.40	
5 h	7496.20	I
10 h	7510.74	I
140	7555.09	I
18	7589.20	I
25	7591.87	I
9 h	7593.64	I
7 h	7594.35	I
12	7602.31	II
16	7605.35	I
12	7617.05	I
14	7627.98	I
40 c	7628.42	I
9 c	7641.14	I
4	7648.16	I
14 c	7653.80	I
12 c	7667.30	I
20	7690.43	I
50 c	7693.15	I
40cw	7715.06	I
16	7719.05	I
16 h	7738.98	I
8 c	7752.01	I
60cw	7815.48	I
40cw	7823.63	I
8 h	7879.22	I
60	7894.64	I
10 h	8464.66	I
10 h	8482.67	I
50	8512.94	I
20	8545.61	II
18	8601.84	II
40	8670.19	I
8 h	8697.32	
16 h	8805.48	II
20 c	8834.49	I
90	8915.98	II

HYDROGEN (H)

Z = 1

H I

Ref. 214 – W.C.M.

Vacuum

Intensity	Wavelength	
15	926.226	I
20	930.748	I
30	937.803	I
50	949.743	I
100	972.537	I
300	1025.722	I
1000	1215.668	I
500	1215.674	I

Air

5	3835.384	I
6	3889.049	I
8	3970.072	I
15	4101.74	I
30	4340.47	I
80	4861.33	I
120	6562.72	I
180	6562.852	I
5	9545.97	I

H I

Intensity	Wavelength	
7	10049.4	I
12	10938.1	I
20	12818.1	I
40	18751.0	I
5	21655.3	I
8	26251.5	I
15	40511.6	I
4	46525.1	I
6	74578	I
3	123685	I

INDIUM (In)

Z = 49

In I and II

Refs. 1,132,348,349,350

– C.H.C.

Vacuum

2	1648.00	I
1 h	1676.16	I
5 h	1711.54	I
2 h	1741.23	I
1 h	1758.49	I

Air

10	2103.89	II
10	2166.88	II
2	2179.90	I
2	2182.40	I
2	2187.40	I
2	2190.84	I
15	2195.67	II
2	2197.41	I
2	2202.24	I
50	2205.28	II
3	2211.14	I
5	2230.70	I
3	2241.66	I
30	2255.79	II
10	2259.99	I
5	2278.20	I
40	2281.64	II
2	2283.75	I
2	2298.33	I
2	2298.70	I
2	2302.49	I
100 c	2306.05	II
25	2306.86	I
3	2309.32	I
2	2309.75	I
90 d	2313.21	II
2	2315.09	I
30	2323.40	II
5	2324.41	I
3	2324.92	I
70 d	2327.95	II
3	2332.76	I
80 h	2334.57	II
10	2340.19	I
8	2345.90	I
5	2346.56	I
50 d	2350.75	II
5	2358.70	I
15	2378.14	I
10	2379.00	I
110 d	2382.63	II
40	2389.54	I
40	2393.18	II
10	2399.18	I

In I and II

Intensity	Wavelength	
50 h	2406.47	II
50	2408.76	II
50	2419.06	II
50	2419.20	II
70 h	2427.20	II
20	2429.86	I
10	2430.99	I
50	2432.73	II
60	2442.63	II
100	2447.90	II
60	2453.23	II
60	2460.08	I
30 h	2468.02	I
70	2486.15	II
110 d	2488.62	II
90	2488.95	II
80	2498.59	II
100	2499.60	II
90 d	2500.99	II
60	2508.16	II
110 d	2512.31	II
100	2521.37	I
10	2522.98	I
70	2553.56	II
160 d	2554.44	II
1100	2560.15	I
70	2565.13	II
70 d	2598.75	II
200	2601.76	I
50	2604.04	II
90 d	2654.70	II
100 d	2662.63	II
140 d	2668.65	II
140 d	2674.56	II
80	2683.12	II
1600	2710.26	I
300	2713.94	I
130 d	2749.75	II
700	2753.88	I
40	2775.37	I
60	2798.76	II
90 d	2818.97	II
180 c	2836.92	I
30 c	2858.14	I
80	2865.68	II
120 d	2890.18	II
1100	2932.63	I
100	2941.05	II
20 c	2957.01	I
60 d	2966.17	II
110 c	2999.40	II
8000	3039.36	I
8 d	3051.15	I
110 d	3099.80	II
180 c	3101.8	II
130 c	3138.60	II
80 c	3142.75	II
130 d	3146.70	II
150	3155.77	II
100 c	3158.40	II
90 c	3176.30	II
90 d	3198.11	II
13000	3256.09	I
3000	3258.56	I
90 c	3338.50	II
75 c	3376.59	II
100 c	3404.28	II
110 d	3438.40	II
180 c	3693.91	II

In I and II		
Intensity	Wavelength	
95 c	3708.13	II
380 w	3716.14	II
120 c	3718.30	II
160 c	3718.72	II
160 c	3723.40	II
170 w	3795.21	II
230 c	3799.21	II
250 c	3834.65	II
200 c	3842.18	II
100	3889.78	II
100 c	3902.07	II
60 d	3922.12	II
65 c	3934.40	II
250 w	3962.35	II
120 c	4004.66	II
140 d	4013.92	II
410 w	4056.94	II
17000	4101.76	I
140 c	4205.14	II
100 d	4213.04	II
110 d	4219.66	II
150 d	4372.87	II
150 c	4500.78	II
18000	4511.31	I
110 c	4549.01	II
140 c	4570.85	II
180 w	4578.02	II
180 w	4578.40	II
140 c	4616.08	II
170 c	4617.17	II
250 c	4620.14	II
150 w	4620.70	II
170 c	4627.30	II
140 c	4637.04	II
380 c	4638.16	II
220 c	4644.58	II
360 c	4655.62	II
320 w	4656.74	II
190 c	4681.11	II
450 w	4684.8	II
3	4878.37	I
90 d	4907.06	II
70 h	4924.93	II
150 c	4973.77	II
80 h	5109.36	II
100 w	5115.14	II
140 c	5117.40	II
270 c	5120.80	II
200 w	5121.75	II
80 d	5129.85	II
240 c	5175.42	II
140 c	5184.44	II
30	5254.32	I
12	5262.74	I
150 c	5309.45	II
80	5411.41	II
140 c	5418.45	II
220 w	5436.70	II
130 c	5497.50	II
140 c	5507.08	II
320 c	5513.00	II
250 w	5523.28	II
130 c	5536.50	II
190 w	5555.45	II
240 c	5576.90	II
200 w	5636.70	II
160 c	5708.50	II
50	5709.91	I
100 c	5721.80	II

In I and II		
Intensity	Wavelength	
50	5727.68	I
210 c	5853.15	II
490 w	5903.4	II
260 w	5915.4	II
120 c	5918.78	II
130 c	6062.9	II
250 c	6095.95	II
210 c	6108.66	II
180 w	6115.9	II
230 w	6128.7	II
240 w	6129.4	II
320 w	6132.1	II
150 c	6140.0	II
90	6143.23	II
140 c	6148.10	II
190 w	6149.5	II
80	6161.15	II
180 w	6162.45	II
100 c	6224.28	II
280 w	6228.3	II
140 w	6231.1	II
270 w	6304.8	II
290 w	6362.3	II
300 w	6469.0	II
210 c	6541.20	II
190 c	6751.88	II
180 c	6765.9	II
100 c	6783.72	II
8 h	6847.44	I
320 w	6891.5	II
4 h	6900.13	I
380 w	7182.9	II
180 c	7255.0	II
210 c	7276.5	II
180 c	7303.4	II
320 c	7350.6	II
100 c	7632.7	II
100 c	7682.9	II
210 c	7740.7	II
100 c	7776.96	II
180 c	7789.0	II
70 c	7806.8	II
70 c	7814.5	II
90 c	7840.9	II
20 h	8050.78	I
240 c	8227.0	II
30 h	8238.66	I
15 h	8314.92	I
50 c	8434.55	II
30	8678.95	I
20	8682.63	I
50	8700.25	I
100 w	8813.5	II
80 c	8832.6	II
40	8894.47	I
10	9170.08	I
120 c	9197.7	II
120 c	9202.0	II
220 w	9213.0	II
160 d	9241.1	II
40 h	9349.83	I
60 h	9370.27	I
20	9427.99	I
100	9977.86	I
200	10257.03	I
60 h	10717.42	I
100 h	10744.31	I
20	11334.72	I
20	11731.48	I

In I and II		
Intensity	Wavelength	
10	12912.59	I
9	13429.96	I
5	13824.48	I
6	14316.25	I
3	14419.20	I
6	14668.66	I
7	14719.08	I
2	16504.31	I
6	22291.06	I
7	23879.13	I
In III		
Ref. 351 - C.H.C.		
Vacuum		
7	685.31	III
5	691.62	III
1	782.17	III
10	882.24	III
10	890.84	III
10	915.87	III
2	917.45	III
5	926.83	III
30	1403.08	III
30	1434.85	III
20	1487.70	III
20	1494.14	III
10	1524.78	III
20	1530.21	III
30	1532.95	III
100	1625.42	III
20	1642.28	III
20	1702.53	III
100	1748.83	III
2	1767.88	III
1	1810.71	III
30	1842.41	III
40	1850.30	III
15	1862.98	III
Air		
30	2154.08	III
2	2154.42	III
10	2199.52	III
5	2232.18	III
20	2261.26	III
5	2266.26	III
5	2272.41	III
5	2272.84	III
10	2300.90	III
100	2527.41	III
50	2725.52	III
80	2726.15	III
100	2982.80	III
100	3008.08	III
30	3008.82	III
30	3293.55	III
8	3350.91	III
5	3562.32	III
100	3852.82	III
100	4023.77	III
150	4032.32	III
50	4062.30	III
100	4071.57	III
100	4072.93	III
100	4252.68	III
40	4509.58	III
200	5248.77	III
100	5645.15	III
40	5723.17	III
100	5819.50	III

In III		
Intensity	Wavelength	
200	6197.72	III
In IV		
Ref. 352 - C.H.C.		
Vacuum		
8	677.33	IV
15	684.53	IV
8	720.64	IV
4	1470.34	IV
5	1512.62	IV
5	1523.50	IV
7	1532.03	IV
8	1568.92	IV
3	1569.33	IV
12	1601.50	IV
7	1606.59	IV
10	1628.48	IV
8	1651.80	IV
10	1655.62	IV
1	1667.38	IV
5	1670.64	IV
12	1678.07	IV
4	1702.02	IV
15	1707.11	IV
7	1721.89	IV
12	1747.65	IV
10	1748.10	IV
10	1768.77	IV
12	1773.01	IV
8	1789.15	IV
12	1793.38	IV
12	1844.67	IV
9	1851.10	IV
9	1855.84	IV
15	1856.64	IV
15	1874.08	IV
5	1903.52	IV
5	1939.58	IV
3	1943.31	IV
Air		
6	2004.73	IV
1	2101.17	IV
8	2112.31	IV
4	2225.13	IV
1	1605.08	IV
In V		
Ref. 353 - C.H.C.		
Vacuum		
6	368.67	V
6	370.10	V
10	372.82	V
10	372.94	V
2	374.95	V
6	375.84	V
6	376.07	V
10	376.79	V
17	378.61	V
3	379.24	V
9	380.27	V
11	381.56	V
9	382.14	V
11	382.76	V
10	383.05	V
17	386.21	V
10	386.70	V
3	388.66	V
14	388.91	V
11	390.03	V
11	390.92	V

In V		
Intensity	Wavelength	
9	392.29	V
9	392.46	V
1	393.60	V
25	393.89	V
11	395.74	V
3	397.73	V
10	399.79	V
9	400.05	V
25	400.57	V
25	402.39	V
3	405.33	V
9	407.28	V
3	407.36	V
9	407.95	V
9	417.43	V
2	418.45	V
2	423.16	V

IODINE (I)

Z = 53

I I and II

Refs. 124,153,176,184 – L.J.R.

Vacuum

Intensity	Wavelength	
2	655.80	II
6	659.00	II
8	663.98	II
8	664.52	II
8	665.06	II
150	665.70	II
1000	719.55	II
1000	722.98	II
1000	798.16	II
1200	834.10	II
600	847.80	II
1500	873.49	II
1000	875.94	II
2000	879.84	II
1500	881.88	II
1000	891.00	II
1000	893.17	II
1200	1000.57	II
1000	1003.35	II
4000	1018.58	II
10000	1034.66	II
1500	1054.74	II
2000	1066.34	II
3000	1075.21	II
5000	1105.00	II
2500	1111.16	II
1500	1117.22	II
3500	1125.25	II
2000	1131.50	II
1200	1139.75	II
10000	1139.80	II
1500	1154.67	II
1000	1159.87	II
10000	1160.56	II
20000	1166.48	II
1500	1167.05	II
5000	1175.84	II
10000	1178.65	II
15000	1187.34	II
10000	1190.85	II
15	1195.29	I
5000	1198.88	II
7000	1200.22	II

I I and II		
Intensity	Wavelength	
200	1218.41	I
20000	1220.89	II
600	1224.05	I
600	1224.08	I
500	1228.89	I
20000	1234.06	II
600	1251.34	I
2500	1259.15	I
3000	1259.51	I
800	1261.27	I
600	1267.57	I
600	1267.60	I
1500	1275.26	I
3000	1289.40	I
10000	1300.34	I
3000	1302.98	I
3000	1313.95	I
3000	1317.54	I
2000	1330.19	I
20000	1336.52	II
5000	1355.10	I
3000	1357.97	I
5000	1360.97	I
3000	1361.11	I
2500	1367.71	I
2500	1368.22	I
4000	1383.23	I
3000	1390.75	I
2000	1392.90	I
2000	1400.01	I
8000	1425.49	I
5000	1446.26	I
5000	1453.18	I
5000	1457.39	I
5000	1457.47	I
10000	1457.98	I
2500	1458.79	I
4000	1459.15	I
2500	1465.83	I
1000	1485.92	I
5000	1492.89	I
5000	1507.04	I
5000	1514.68	I
15000	1518.05	I
2500	1526.45	I
5000	1593.58	I
5000	1617.60	I
2500	1640.78	I
15000	1702.07	I
12000	1782.76	I
5000	1799.09	I
75000	1830.38	I
15000	1844.45	I
	Air	
2000	2061.63	I
100	2408.01	II
100	2419.18	II
100	2494.74	II
100	2533.60	II
200	2534.27	II
1000	2566.24	II
2000	2582.79	II
300	2593.46	II
200 c	2688.98	II
500	2730.12	II
20	2765.15	II
200	2808.59	II
1500	2878.63	II
1000	2993.87	II

I I and II		
Intensity	Wavelength	
5000	3078.75	II
200	3161.03	II
1000	3175.07	II
300	3355.53	II
250 c	3424.99	II
300 c	3497.41	II
500	3526.90	II
200	3742.14	II
200	4102.23	I
200	4129.21	I
100 d	4134.15	I
500 d	4321.84	I
300	4452.86	II
200	4599.77	II
300 c	4632.45	II
500 d	4666.48	II
1000	4675.53	II
250	4763.31	I
1000	4862.32	I
200	4916.94	I
1000	4986.92	II
400 c	5065.37	II
10000	5119.29	I
200	5149.73	II
3000 c	5161.20	II
300	5176.19	II
600	5216.27	II
500 d	5228.97	II
1000	5234.57	I
3000 c	5245.71	II
500	5269.36	II
400	5299.78	II
400	5322.80	II
10000	5338.22	II
5000 c	5345.15	II
1000 c	5369.86	II
800 c	5405.42	II
800 c	5407.36	II
600 c	5427.06	I
3000	5435.83	II
1000	5438.00	II
2000 c	5464.62	II
800	5491.50	II
1000 c	5496.94	II
1000	5504.72	II
600 c	5522.06	II
600 c	5598.52	II
1000	5600.32	II
1500	5612.89	II
10000	5625.69	II
1000	5678.08	II
2000 c	5690.91	II
500	5702.05	II
4000 c	5710.53	II
1000	5738.27	II
1000	5760.72	II
1000 d	5764.33	I
500 c	5774.83	II
500	5787.02	II
2000	5894.03	I
5000	5950.25	II
300	5984.86	I
2000 d	6024.08	I
500	6068.93	II
2000 c	6074.98	II
1000	6082.43	I
2000 c	6127.49	II
800	6191.88	I
1000	6204.86	II

I I and II		
Intensity	Wavelength	
500	6213.10	I
800	6244.48	I
900 c	6257.49	II
1000	6293.98	I
500	6313.13	I
800	6330.37	I
400	6333.50	I
2000	6337.85	I
1000	6339.44	I
500	6359.16	I
1000	6566.49	I
2000	6583.75	I
1000	6585.27	I
5000	6619.66	I
500	6661.11	I
600	6665.96	II
500 c	6697.29	I
300	6718.83	II
400	6732.03	I
4000	6812.57	II
1000	6958.78	II
500	6989.78	I
200 c	7085.21	II
500	7120.05	I
1200	7122.05	I
2000	7142.06	I
1000	7164.79	I
400 d	7191.66	I
700	7227.30	I
1000	7236.78	I
500	7237.84	I
500	7351.35	II
5000	7402.06	I
1000	7410.50	I
500	7416.48	I
5000	7468.99	I
500 c	7490.52	I
2000	7554.18	I
500 d	7556.65	I
2000 c	7700.20	I
500	7798.98	II
600	7897.98	I
500	7969.48	I
1000	8003.63	I
99000	8043.74	I
300 d	8065.70	I
1000	8090.76	I
800 c	8169.38	I
500 d	8222.57	I
4000	8240.05	I
10000 c	8393.30	I
150	8414.60	II
1000	8486.11	I
1500 c	8664.95	I
500 c	8700.80	I
250 d	8748.22	I
1000	8853.24	I
2000	8853.80	I
3000	8857.50	I
1000 d	8898.50	I
400	8964.69	I
400	8993.13	I
5000	9022.40	I
15000	9058.33	I
1000	9098.86	I
12000	9113.91	I
600	9128.03	I
30	9195.30	II
600	9227.74	I

I I and II			I III			I IV			Ir I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
1000	9335.05	I	2	2309.38	III	7	919.28	IV	2000	2125.44	I
4000	9426.71	I	3	2340.85	III		Air		4500	2126.81	II
3000	9427.15	I	3	2350.43	III	5	2249.30	IV	2000	2127.52	I
10 c	9480.33	II	2	2353.46	III	4	2340.84	IV	4500	2127.94	I
2000	9598.22	I	4	2367.74	III	7	2361.13	IV	3700	2148.22	I
2000	9649.61	I	2	2371.45	III	5	2367.75	IV	2500	2150.54	I
3000 d	9653.06	I	3	2372.45	III	6	2372.45	IV	3500	2152.68	II
5000	9731.73	I	4	2376.47	III	7	2376.46	IV	2900	2155.81	I
500	10003.05	I	4	2387.12	III	4	2385.28	IV	7900	2158.05	I
750	10131.16	I	3	2392.01	III	8	2387.11	IV	2100	2162.88	I
1000	10238.82	I	2	2403.06	III	6	2392.00	IV	5800	2169.42	II
400	10375.20	I	2	2403.63	III	4	2403.05	IV	4500	2175.24	I
400	10391.74	I	2	2414.85	III	2	2418.45	IV	2700	2178.17	I
6	10405.49	II	2	2418.49	III	3	2423.89	IV	1600	2187.43	II
5000	10466.54	I	2	2418.85	III	9	2426.10	IV	1100	2190.38	II
1	11084.68	II	2	2423.91	III	6	2434.85	IV	740	2191.64	I
400	11236.56	I	5	2426.12	III	3	2466.68	IV	910	2208.09	II
350	11558.46	I	3	2434.88	III	3	2466.96	IV	1300	2220.37	I
320	11778.34	I	2	2462.50	III	8	2475.35	IV	790	2221.07	II
450	11996.86	I	3	2466.69	III	4	2485.51	IV	2500	2242.68	II
300	12033.69	I	3	2466.99	III	5	2489.24	IV	620	2245.76	II
150	12304.58	I	6	2475.36	III	4	2493.20	IV	2100	2253.38	I
60	13149.16	I	4	2489.27	III	2	2501.38	IV		2253.49	I
140	13958.27	I	2	2493.21	III	3	2513.74	IV	2100	2255.10	I
200	14287.02	I	2	2494.27	III	8	2519.74	IV	1400	2255.81	I
100	14460.00	I	3	2495.16	III	6	2521.72	IV	350	2258.51	I
225	15032.57	I	2	2496.07	III	4	2531.98	IV	1400	2258.86	I
105	15528.65	I	3	2501.41	III	5	2537.54	IV	830	2264.61	I
150	16037.33	I	2	2516.82	III	8	2545.67	IV	1100	2266.33	I
15	18275.71	I	6	2519.75	III	4	2640.77	IV	1000	2268.90	I
20	18348.52	I	4	2521.72	III	5	2642.11	IV	660	2280.00	I
15	18982.41	I	3	2531.99	III	8	2652.23	IV	950	2281.02	II
35	19070.17	I	2	2537.56	III	3	2818.45	IV	660	2281.91	I
110	19105.12	I	7	2545.71	III	6	2864.68	IV	330	2284.60	I
50	19370.02	I	4	2640.77	III	4	2910.97	IV	330	2295.08	I
10	20648.69	I	4	2642.11	III	5	2917.33	IV	790	2298.05	I
220	22183.03	I	6	2652.25	III	4	3069.17	IV		2298.16	I
150	22226.53	I	2	2818.48	III	4	3170.11	IV	460	2299.53	I
30	22309.21	I	2	2839.44	III	4	3181.64	IV	910	2300.50	I
32	24420.82	I	4	2864.67	III	4	3210.12	IV	2700	2304.22	I
12	27365.42	I	4	2885.15	III	6	3213.48	IV	410	2305.47	I
9	27573.05	I	3	2910.98	III	6	3224.90	IV	210	2307.27	I
10	30361.93	I	3	2917.35	III	4	3546.90	IV	910	2308.93	I
8	30383.88	I	2	2931.11	III				460	2315.38	I
10	34295.73	I	2	3005.68	III		I V		410	2321.45	I
9	34513.11	I	3	3069.23	III		Ref. 84 - L.J.R.		410	2321.58	I
3	40228.54	I	3	3153.88	III		Vacuum		210	2327.98	I
2	41633.80	I	3	3170.14	III	30	363.78	V	540	2333.30	I
			3	3181.66	III	36	380.74	V	740	2333.84	I
	I III		3	3210.14	III	45	565.53	V	580	2334.50	I
	Refs. 20,21,161 - L.J.R.		4	3213.49	III	50	607.57	V	1600	2343.18	I
	Vacuum		4	3224.93	III				740	2343.61	I
6	666.81	III	2	3300.47	III		**IRIDIUM (Ir)**		100	2352.62	I
8	705.11	III	2	3479.53	III				580	2355.00	I
7	784.64	III	3	3546.92	III		**Z = 77**		230	2357.53	II
7	784.80	III	3	3613.81	III				410	2358.16	I
8	795.52	III	2	3754.40	III		Ir I and II		500	2360.73	I
5	865.97	III	2	3754.55	III		Ref. 1 - C.H.C.		2500	2363.04	I
5	920.38	III	3	3963.16	III		Air		370	2368.04	II
6	961.17	III	3	4077.14	III	9900	2010.65	I	3500	2372.77	I
6	1078.58	III				8700	2022.35	I	290	2375.09	II
8	1094.20	III		I IV		15000	2033.57	I	250	2377.28	I
4	1244.66	III		Refs. 21,158 - L.J.R.		6200	2052.22	I	250	2377.98	I
8	1252.35	III		Vacuum		5000	2060.64	I	500	2379.38	I
5	1306.93	III	5	601.86	IV	3700	2083.22	I	540	2381.62	I
	Air		6	612.46	IV	3100	2085.74	I	210	2383.17	I
1	2224.43	III	4	615.17	IV	17000	2088.82	I	120	2386.58	II
1	2238.12	III	4	654.22	IV	14000	2092.63	I	1300	2386.89	I
3	2249.31	III	4	654.56	IV	2700	2112.68	I	2500	2390.62	I
						1800	2119.54	I			

Ir I and II			Ir I and II			Ir I and II			Ir I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
2700	2391.18	I	230	2572.70	I	1200	2934.64	I	410	3522.03	I
230	2407.59	I	740	2577.26	I	880	2936.68	I	160	3557.17	I
290	2409.37	I	100	2578.71	I	250	2938.47	I	320	3558.99	I
290	2410.17	I	35	2579.49	II	190	2939.27	I	1200	3573.72	I
290	2410.73	I	740	2592.06	I	140	2940.54	I	320	3594.39	I
540	2413.31	I	740	2599.04	I	2700	2943.15	I	220	3609.77	I
370	2415.86	I	150	2602.04	I	230	2946.97	I	190	3617.21	I
620	2418.11	I	190	2604.55	I	200	2949.76	I	160	3626.29	I
120	2424.32	I	190	2607.52	I	1200	2951.22	I	660	3628.67	I
120	2424.66	I	700	2608.25	I	150	2962.99	I	220	3636.20	I
210	2424.89	I	1800	2611.30	I	200	2974.95	I	300	3661.71	I
370	2424.99	I	210	2614.98	I	440	2980.65	I	300	3664.62	I
290	2425.66	I	330	2617.78	I	150	2985.80	I	320	3674.98	I
170	2426.53	II	210	2619.88	I	190	2990.62	I	200	3687.08	I
540	2427.61	I	70	2623.64	II	300	2996.08	I	140	3725.38	I
540	2431.24	I	250	2625.32	I	180	2997.41	I	200	3731.36	II
1300	2431.94	I	100	2626.76	I	220	3002.25	I	130	3738.53	I
170	2432.36	I	700	2634.17	I	600	3003.63	I	530	3747.20	I
100	2432.58	I	170	2635.27	I	160	3011.69	I	120	3793.79	I
270	2435.14	I	250	2639.42	I	120	3016.43	I	3100	3800.12	I
250	2445.34	I	3500	2639.71	I	270	3017.31	I	230	3817.24	I
250	2447.76	I	210	2644.19	I	140	3019.23	I	170	3865.64	I
190	2448.23	I	170	2653.76	I	110	3025.82	I	480	3902.51	I
910	2452.81	I	100	2656.81	I	380	3029.36	I	480	3915.38	I
1300	2455.61	I	1800	2661.98	I	330	3039.26	I	400	3934.84	I
230	2455.87	I	350	2662.63	I	35	3042.65	II	120	3946.27	I
210	2457.03	I	2700	2664.79	I	300	3047.16	I	590	3976.31	I
210	2457.23	I	140	2668.99	I	300	3049.44	I	460	3992.12	I
120	2465.09	I	520	2669.91	I	300	3057.28	I	180	4020.03	I
870	2467.30	I	520	2671.84	I	1600	3068.89	I	350	4033.76	I
3300	2475.12	I	330	2673.61	I	190	3069.09	I	130	4040.08	I
210	2478.11	I	120	2676.83	I	190	3069.71	I	370	4069.92	I
2100	2481.18	I	110	2684.04	I	170	3076.69	I	150	4070.68	I
100	2485.38	I	270	2692.34	I	320	3083.22	I	100	4092.61	I
620	2493.08	I	3000	2694.23	I	240	3086.44	I	140	4115.78	I
210	2496.27	I	110	2704.03	I	390	3088.04	I	23	4127.92	I
250	2502.63	I	160	2712.74	I	510	3100.29	I	27	4155.70	I
4100	2502.98	I	140	2744.00	I	510	3100.45	I	15	4166.04	I
170	2504.37	I	330	2772.46	I	340	3120.76	I	90	4172.56	I
120	2505.74	I	250	2775.55	I	200	3121.78	I	35	4182.47	I
120	2507.63	I	520	2781.29	I	3400	3133.32	I	15 h	4183.21	I
170	2509.71	I	330	2785.22	I	190	3150.61	I	18	4185.66	I
170	2511.94	I	540	2797.35	I	190	3154.74	I	23	4197.54	I
170	2512.58	II	1600	2797.70	I	190	3159.15	I	27	4217.76	I
210	2513.71	I	380	2798.18	I	140	3168.18	I	13	4220.80	I
120	2515.36	I	410	2800.82	I	490	3168.88	I	75	4259.11	I
40	2524.88	II	680	2823.18	I	370	3177.58	I	27	4265.30	I
170	2525.05	I	1200	2824.45	I	170	3180.35	I	260	4268.10	I
120	2532.52	I	110	2833.24	II	370	3198.92	I	23	4286.62	I
990	2533.13	I	110	2835.66	I	610	3212.12	I	75	4301.60	I
1100	2534.46	I	820	2836.40	I	370	3219.51	I	55	4310.59	I
580	2537.22	I	160	2837.33	I	5100	3220.78	I	220	4311.50	I
170	2537.68	I	1100	2839.16	I	100	3221.28	I	18	4351.30	I
100	2541.48	I	820	2840.22	I	300	3229.28	I	18	4352.56	I
580	2542.02	I	160	2842.28	I	100	3230.76	I	18	4392.59	I
40	2542.80	II	3800	2849.72	I	470	3241.52	I	160	4399.47	I
7900	2543.97	I	110	2863.84	I	200	3262.01	I	65	4403.78	I
150	2545.54	I	380	2875.60	I	390	3266.44	I	110	4426.27	I
790	2546.03	I	380	2875.98	I	160	3277.28	I	15	4450.18	I
120	2547.20	I	270	2877.68	I	100	3287.59	I	55	4478.48	I
120	2547.69	I	140	2879.41	I	160	3310.52	I	16	4495.35	I
210	2551.40	I	820	2882.64	I	200	3322.60	I	11 h	4496.03	I
190	2554.40	I	650	2897.15	I	130	3334.16	I	55	4545.68	I
210	2555.35	I	260	2901.95	I	560	3368.48	I	30	4548.48	I
170	2555.88	I	260	2904.80	I	660	3437.02	I	13	4550.78	I
150	2563.28	I	200	2907.24	I	100	3437.50	I	35	4568.09	I
910	2564.18	I	440	2916.36	I	410	3448.97	I	18	4570.02	I
210	2569.88	I	230	2918.57	I	3200	3513.64	I	18	4604.48	I
100	2570.62	I	4400	2924.79	I	220	3515.95	I	75	4616.39	I

Ir I and II		
Intensity	Wavelength	
26	4656.18	I
17 h	4668.99	I
21	4708.88	I
50	4728.86	I
21	4731.86	I
26	4756.46	I
13	4757.96	I
65	4778.16	I
30	4795.67	I
10	4807.14	I
21	4809.47	I
10	4840.77	I
17	4845.38	I
50	4938.09	I
26	4970.48	I
25	4999.74	I
25	5002.74	I
17	5009.17	I
30	5014.98	I
17	5046.06	I
30	5123.66	I
20	5177.95	I
22	5238.92	I
12	5340.74	I
35	5364.32	I
75	5449.50	I
30	5454.50	I
7	5469.40	I
10	5620.04	I
45	5625.55	I
10	5828.55	I
10	5882.30	I
7	5887.36	I
35	5894.06	I
7	6026.10	I
12	6067.83	I
20	6110.67	I
12	6288.28	I
7	6334.44	I
5	6624.73	I
10	6686.08	I
5	6830.01	I
5	6929.88	I
4	7183.71	I
6	7834.32	I

IRON (Fe)

Z = 26

Fe I and II		
Refs. 56,63,105,138,174,278 – H.M.C. and H.C.		
Vacuum		
12	1055.27	II
15	1068.36	II
15	1071.60	II
15	1096.89	II
12	1099.12	II
18	1112.09	II
12	1121.99	II
12	1122.86	II
12	1128.07	II
12	1130.43	II
15	1133.41	II
12	1133.68	II
12	1138.64	II
12	1142.33	II
12	1143.23	II

Fe I and II		
Intensity	Wavelength	
18	1144.95	II
12	1147.41	II
15	1148.29	II
12	1151.16	II
12	1267.44	II
12	1272.00	II
12	1371.02	II
12	1563.79	II
12	1580.62	II
18	1608.46	II
12	1618.47	II
15	1621.68	II
15	1629.15	II
15	1631.12	II
18	1635.40	II
15	1636.32	II
15	1639.40	II
12	1641.76	II
12	1647.16	II
12	1670.74	II
12	1702.04	II
12	1761.38	II
20	1785.26	II
20	1786.74	II
18	1788.07	II
30	1934.538	I
25	1937.269	I
50	1946.988	I
25	1951.571	I
30	1952.59	I
30	1953.005	I
60	1957.823	I
60	1960.144	I
30	1961.25	I
50	1962.111	I
12	1963.11	II
	Air	
100	2084.122	I
50	2157.794	I
15	2162.02	II
40	2166.773	I
300	2178.118	I
250	2186.486	I
60	2186.892	I
120	2187.195	I
250	2191.839	I
150	2196.043	I
80	2200.390	I
80	2200.724	I
15	2208.41	II
20	2213.65	II
12	2218.26	II
20	2220.38	II
25	2245.58	II
50	2250.790	I
60	2251.874	I
25	2255.77	II
300	2259.511	I
60	2264.389	I
80	2267.085	I
80	2267.469	I
50	2270.862	I
150	2272.070	I
150	2276.026	I
80	2279.937	I
150	2284.086	I
150	2287.250	I
300	2292.524	I
80	2294.41	I

Fe I and II		
Intensity	Wavelength	
200	2297.787	I
600	2298.169	I
80	2299.220	I
300	2300.142	I
50	2301.684	I
100	2303.424	I
150	2303.581	I
120	2308.999	I
150	2313.104	I
200	2320.358	I
100	2327.40	II
15	2327.88	II
100	2331.31	II
15	2331.97	II
300	2332.80	II
200	2338.01	II
600	2343.49	II
80	2343.96	II
150	2344.28	II
25	2344.98	II
50	2345.34	II
200	2348.11	II
250	2348.30	II
50	2351.20	II
15	2351.67	II
25	2352.31	II
30	2353.47	II
15	2353.68	II
50	2354.48	II
40	2354.89	II
200	2359.12	II
15	2359.59	II
150	2360.00	II
120	2360.29	II
30	2360.51	II
40	2362.02	II
60	2363.86	II
200	2364.83	II
80	2365.76	II
25	2366.59	II
80	2368.59	II
80	2369.456	I
80	2369.95	II
25	2370.50	II
120	2371.430	I
300	2373.624	I
150	2373.74	II
120	2374.518	I
60	2375.19	II
120	2376.43	II
20	2378.13	II
80	2379.27	II
20	2379.41	II
40	2380.20	II
120	2380.76	II
150	2381.835	I
1000	2382.04	II
20	2382.90	II
20	2383.06	II
60	2383.25	II
50	2384.39	II
40	2388.37	II
300	2388.63	II
200	2389.973	I
30	2390.10	II
20	2390.77	II
15	2391.48	II
20	2392.58	II
40	2395.42	II

Fe I and II		
Intensity	Wavelength	
1000	2395.62	II
15	2396.72	II
300	2399.24	II
20	2400.05	II
15	2401.29	II
50	2404.43	II
800	2404.88	II
250	2406.66	II
80	2406.97	II
300	2410.52	II
200	2411.07	II
50	2411.81	II
150	2413.31	II
20	2416.45	II
80	2417.87	II
15	2418.44	II
60	2420.396	I
60	2422.69	II
60	2423.089	I
40	2423.21	II
150	2424.14	II
15	2424.39	II
30	2424.59	II
30	2428.29	II
120	2428.36	II
25	2428.80	II
25	2429.03	II
20	2429.39	II
30	2429.86	II
120	2430.08	II
25	2431.02	II
80	2432.26	II
60	2432.87	II
25	2434.06	II
20	2434.24	II
20	2434.65	II
50	2434.73	II
50	2434.95	II
25	2436.62	II
60	2438.182	I
150	2439.30	II
150	2439.74	I
80	2440.11	I
40	2440.42	II
30	2442.37	II
100	2442.57	I
60	2443.71	II
250	2443.872	I
100	2444.51	II
50	2445.11	II
50	2445.212	I
100	2445.57	II
40	2445.80	II
50	2446.11	II
30	2446.47	II
40	2447.20	II
25	2447.33	II
60	2447.709	I
30	2447.75	II
25	2449.96	II
25	2450.20	II
100	2453.476	I
20	2453.98	II
30	2454.58	II
15	2455.71	II
15	2455.90	II
15	2457.09	II
1500	2457.598	I
150	2458.78	II

Fe I and II			Fe I and II			Fe I and II			Fe I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
40	2458.97	II	20	2493.88	II	150	2538.99	II	30	2666.64	II
60	2460.44	II	60	2494.000	I	50	2539.357	I	300	2666.812	I
80	2461.28	II	50	2494.251	I	20	2540.52	II	60	2666.965	I
100	2461.86	II	100	2495.87	I	200	2540.66	II	600	2679.062	I
100	2462.181	I	600	2496.533	I	600	2540.972	I	500	2684.75	II
1500	2462.647	I	50	2497.82	II	80	2541.10	II	400	2689.212	I
50	2463.29	II	150	2498.90	I	60	2541.84	II	60	2692.60	II
50	2463.730	I	40	2500.92	II	300	2542.10	I	50	2696.28	I
40	2464.01	II	1000	2501.132	I	25	2542.78	II	200	2699.106	I
40	2464.90	II	40	2501.31	II	60	2543.38	II	60	2703.99	II
800	2465.149	I	50	2501.693	I	250	2543.92	I	80	2706.012	I
50	2465.91	II	60	2502.39	II	150	2544.70	I	400	2706.582	I
15	2466.50	II	40	2503.33	II	40	2544.97	II	60	2708.571	I
60	2466.67	II	20	2503.57	II	40	2545.22	II	20	2709.05	II
60	2466.82	II	60	2503.87	II	20	2545.44	II	200	2711.655	I
60	2467.732	I	80	2506.09	II	800	2545.978	I	80	2714.41	II
15	2468.29	II	40	2506.80	II	40	2546.44	II	50	2716.22	II
600	2468.879	I	500	2507.900	I	80	2546.67	II	50	2716.257	I
60	2469.51	II	30	2508.34	II	80	2546.87	I	50	2717.786	I
25	2470.41	II	50	2508.753	I	20	2548.59	II	50	2717.87	II
80	2470.67	II	1000	2510.835	I	100	2548.74	II	250	2718.436	I
80	2470.965	I	120	2511.76	II	80	2549.08	II	4000	2719.027	I
800	2472.336	I	80	2512.275	I	80	2549.39	II	100	2719.420	I
40	2472.43	II	400	2512.365	I	60	2549.46	II	50	2720.197	I
40	2472.60	II	50	2514.38	II	600	2549.613	I	1500	2720.903	I
1000	2472.895	I	80	2516.570	I	40	2549.77	II	400	2723.578	I
200	2473.16	I	50	2517.13	II	60	2550.03	II	30	2724.88	II
50	2473.32	II	300	2517.661	I	25	2550.15	II	150	2724.953	I
30	2474.05	II	800	2518.102	I	50	2550.68	II	80	2726.05	I
600	2474.814	I	60	2519.05	II	40	2560.28	II	50	2726.235	I
50	2475.12	II	150	2519.629	I	25	2562.09	II	25	2727.38	II
40	2475.54	II	40	2521.09	II	400	2562.53	II	80	2727.54	II
15	2476.26	II	30	2521.82	II	200	2563.48	II	200	2728.020	I
60	2476.657	I	50	2522.480	I	20	2566.22	II	50	2728.820	I
25	2477.34	II	4000	2522.849	I	60	2566.91	II	80	2728.90	II
60	2478.57	II	200	2523.66	I	25	2570.52	II	40	2730.73	II
120	2479.480	I	500	2524.293	I	30	2570.85	II	1000	2733.581	I
1200	2479.776	I	100	2525.02	I	150	2574.36	II	60	2734.005	I
100	2480.16	II	200	2525.39	II	50	2575.74	I	50	2734.268	I
15	2481.05	II	25	2526.07	II	300	2576.691	I	500	2735.475	I
80	2482.12	II	300	2526.29	II	25	2576.86	II	50	2735.612	I
25	2482.32	II	20	2527.10	II	60	2577.92	II	500	2737.310	I
100	2482.66	II	2000	2527.435	I	100	2582.58	II	120	2737.83	I
15	2482.87	II	30	2527.70	II	1500	2584.54	I	400	2739.55	II
10000	2483.271	I	20	2528.88	II	60	2593.51	I	250	2742.254	I
300	2483.533	I	20	2529.08	II	20	2605.34	II	800	2742.405	I
15	2483.72	II	800	2529.135	I	20	2605.42	II	200	2743.20	II
1000	2484.185	I	25	2529.23	II	60	2605.657	I	150	2743.565	I
60	2484.24	II	80	2529.31	I	300	2606.51	II	200	2744.068	I
30	2484.44	II	250	2529.55	II	800	2606.827	I	80	2744.527	I
50	2485.990	I	150	2529.836	I	20	2611.07	II	300	2746.48	II
800	2486.373	I	40	2530.11	II	600	2611.87	II	100	2749.32	II
100	2486.691	I	200	2530.687	I	250	2618.018	I	500	2749.48	II
100	2487.066	I	20	2531.87	II	20	2619.07	II	1200	2750.140	I
120	2487.370	I	120	2533.63	II	20	2620.69	II	20	2751.13	II
4000	2488.143	I	60	2533.80	I	40	2621.67	II	20	2752.15	II
100	2488.945	I	100	2534.42	II	400	2623.53	I	80	2753.29	II
80	2489.48	II	120	2535.49	II	50	2625.49	II	50	2753.69	I
1000	2489.750	I	400	2535.607	I	200	2625.67	II	150	2754.032	I
50	2489.83	II	60	2536.67	II	150	2628.29	II	100	2754.426	I
50	2489.913	I	200	2536.792	I	20	2630.07	II	30	2754.89	II
3000	2490.644	I	200	2536.80	II	250	2631.05	II	800	2755.73	II
100	2490.71	II	50	2536.84	II	250	2631.32	II	250	2756.328	I
60	2490.86	II	50	2537.14	II	50	2631.61	II	100	2757.316	I
2000	2491.155	I	50	2538.20	II	100	2632.237	I	50	2759.81	I
100	2491.40	II	40	2538.50	II	300	2635.809	I	120	2761.780	I
25	2492.34	II	20	2538.68	II	50	2641.646	I	150	2761.81	II
100	2493.18	II	100	2538.80	II	200	2643.998	I	150	2762.026	I
500	2493.26	II	100	2538.91	II	60	2664.66	II	120	2762.772	I

Fe I and II			Fe I and II			Fe I and II			Fe I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
120	2763.109	I	250	2994.502	I	50	3265.617	I	60	3612.068	I
20	2763.66	II	500	2999.512	I	50	3271.000	I	150	3617.788	I
25	2765.13	II	120	3000.451	I	50	3280.26	I	1500	3618.768	I
80	2766.910	I	800	3000.948	I	150	3286.75	I	200	3621.462	I
250	2767.522	I	60	3001.655	I	120	3305.97	I	150	3622.004	I
50	2769.30	I	15	3002.64	II	200	3306.343	I	150	3623.19	I
25	2769.35	II	200	3007.282	I	400	3355.227	I	100	3631.096	I
300	2772.07	I	500	3008.14	I	80	3355.517	I	1200	3631.463	I
50	2773.23	I	120	3009.569	I	60	3369.546	I	60	3632.041	I
20	2774.69	II	60	3017.627	I	120	3370.783	I	100	3638.298	I
15	2776.91	II	60	3018.983	I	50	3378.678	I	200	3640.389	I
60	2778.07	I	60	3020.01	II	50	3380.110	I	80	3643.717	I
600	2778.220	I	500	3020.491	I	60	3383.978	I	1500	3647.842	I
40	2779.30	II	1500	3020.639	I	12	3388.13	II	250	3649.506	I
50	2783.69	II	600	3021.073	I	50	3392.304	I	80	3650.279	I
30	2785.19	II	500	3024.032	I	150	3392.651	I	200	3651.467	I
3000	2788.10	I	150	3025.638	I	150	3399.333	I	120	3670.024	I
20	2793.89	II	500	3025.842	I	80	3404.353	I	150	3670.089	I
200	2797.78	I	80	3030.148	I	500	3407.458	I	100	3676.311	I
30	2799.29	II	60	3031.214	I	250	3413.131	I	150	3677.629	I
400	2804.521	I	60	3034.484	I	60	3424.284	I	1500	3679.913	I
1500	2806.98	I	40	3036.96	II	500	3427.119	I	200	3682.242	I
2500	2813.287	I	800	3037.389	I	60	3428.748	I	120	3683.054	I
300	2823.276	I	80	3041.637	I	6000	3440.606	I	150	3684.107	I
600	2825.56	I	800	3047.604	I	2500	3440.989	I	120	3685.998	I
50	2825.687	I	600	3057.446	I	1000	3443.876	I	500	3687.456	I
120	2828.808	I	1000	3059.086	I	200	3445.149	I	120	3689.477	I
25	2831.56	II	250	3067.244	I	15	3453.61	II	150	3694.008	I
1500	2832.436	I	120	3075.719	I	1200	3465.860	I	120	3695.051	I
120	2835.950	I	120	3091.577	I	2000	3475.450	I	150	3701.086	I
200	2838.119	I	80	3098.189	I	500	3476.702	I	80	3704.462	I
30	2839.51	II	100	3099.895	I	2500	3490.574	I	1200	3705.566	I
20	2839.80	II	100	3099.968	I	500	3497.840	I	60	3707.041	I
15	2840.65	II	60	3100.303	I	250	3513.817	I	150	3707.821	I
200	2843.631	I	100	3100.665	I	300	3521.261	I	300	3707.919	I
1000	2843.977	I	12	3154.20	II	400	3526.040	I	600	3709.246	I
100	2845.594	I	80	3175.445	I	100	3526.166	I	120	3716.442	I
15	2848.11	II	150	3184.895	I	60	3526.237	I	8000	3719.935	I
15	2848.32	II	250	3191.659	I	60	3526.381	I	1500	3722.563	I
800	2851.797	I	500	3193.226	I	60	3526.467	I	120	3724.377	I
30	2856.91	II	800	3193.299	I	100	3533.199	I	60	3725.491	I
25	2858.34	II	12	3196.08	II	200	3536.556	I	60	3727.093	I
50	2869.307	I	200	3196.928	I	300	3541.083	I	500	3727.619	I
50	2872.334	I	80	3199.500	I	250	3542.075	I	150	3732.396	I
80	2874.172	I	60	3200.47	I	80	3553.739	I	1200	3733.317	I
50	2894.504	I	50	3205.398	I	400	3554.925	I	5000	3734.864	I
120	2912.157	I	50	3211.67	I	200	3556.878	I	120	3735.324	I
120	2929.007	I	100	3211.88	I	400	3558.515	I	6000	3737.131	I
1200	2936.903	I	13	3213.31	II	1000	3565.379	I	100	3738.306	I
60	2941.343	I	200	3214.011	I	1200	3570.097	I	400	3743.362	I
12	2944.40	II	200	3214.396	I	800	3570.25	I	80	3743.47	I
1000	2947.876	I	60	3215.938	I	120	3571.996	I	6000	3745.561	I
60	2950.24	I	50	3217.377	I	100	3573.393	I	1200	3745.899	I
600	2953.940	I	80	3219.583	I	60	3573.829	I	3000	3748.262	I
250	2957.364	I	60	3219.766	I	60	3573.888	I	80	3748.964	I
80	2959.99	I	300	3222.045	I	4000	3581.19	I	3000	3749.485	I
150	2965.254	I	600	3225.78	I	150	3582.199	I	1500	3758.232	I
1500	2966.898	I	13	3227.73	II	150	3584.660	I	400	3760.05	I
120	2969.36	I	80	3227.796	I	120	3584.929	I	1500	3763.788	I
800	2970.099	I	20	3230.42	II	300	3585.319	I	400	3765.54	I
15	2970.52	II	80	3233.05	I	150	3585.705	I	600	3767.191	I
1200	2973.132	I	50	3233.967	I	200	3586.103	I	60	3776.452	I
500	2973.235	I	120	3234.613	I	400	3586.984	I	250	3785.95	I
600	2981.445	I	300	3236.222	I	100	3594.633	I	100	3786.68	I
1000	2983.570	I	100	3239.433	I	150	3603.204	I	250	3787.880	I
60	2984.77	I	80	3244.187	I	200	3605.454	I	250	3790.092	I
50	2984.82	II	80	3246.005	I	500	3606.680	I	150	3794.34	I
13	2985.54	II	60	3254.36	I	1500	3608.859	I	400	3795.002	I
1000	2994.427	I	80	3265.046	I	250	3610.16	I	120	3797.518	I

Fe I and II			Fe I and II			Fe I and II			Fe I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
250	3798.511	I	150	4118.544	I	100	4890.754	I	40	5367.47	I
400	3799.547	I	40	4127.608	I	250	4891.492	I	50	5369.96	I
200	3805.345	I	400	4132.058	I	30	4903.309	I	400	5371.489	I
80	3806.696	I	80	4134.676	I	150	4918.992	I	60	5383.37	I
600	3812.964	I	40	4136.997	I	500	4920.502	I	14	5387.06	II
60	3813.059	I	200	4143.415	I	12	4923.92	II	40	5393.167	I
1500	3815.840	I	800	4143.869	I	1500	4957.597	I	12	5395.86	II
2500	3820.425	I	40	4153.898	I	11	4990.50	II	300	5397.127	I
150	3821.179	I	50	4154.500	I	80	5001.862	I	15	5402.06	II
80	3824.306	I	60	4156.799	I	18	5001.91	II	60	5404.12	I
2500	3824.444	I	50	4172.744	I	11	5004.20	II	250	5405.774	I
1500	3825.880	I	60	4174.912	I	30	5005.711	I	30	5410.91	I
1200	3827.823	I	50	4175.635	I	100	5006.117	I	60	5415.20	I
1000	3834.222	I	50	4177.593	I	60	5012.067	I	60	5424.07	I
120	3839.257	I	120	4181.754	I	30	5014.941	I	30	5427.83	II
500	3840.437	I	50	4184.891	I	12	5018.43	II	250	5429.695	I
800	3841.047	I	120	4187.038	I	11	5030.64	II	13	5429.99	II
120	3843.256	I	120	4187.795	I	25	5030.77	I	100	5434.523	I
80	3846.800	I	80	4191.430	I	12	5035.71	II	200	5446.871	I
200	3849.96	I	40	4195.329	I	150	5041.755	I	25	5455.45	I
120	3850.817	I	150	4198.304	I	30	5049.819	I	120	5455.609	I
2500	3856.372	I	40	4199.095	I	30	5051.634	I	16	5465.93	II
150	3859.212	I	300	4202.029	I	25	5074.748	I	20	5466.94	II
10000	3859.911	I	40	4203.984	I	18	5100.73	II	16	5482.31	II
150	3865.523	I	80	4206.696	I	15	5100.95	II	14	5493.83	II
60	3867.215	I	80	4210.343	I	150	5110.357	I	25	5497.516	I
250	3872.501	I	400	4216.183	I	40	5133.69	I	20	5501.464	I
150	3873.761	I	100	4219.360	I	40	5139.251	I	18	5506.20	II
250	3878.018	I	50	4222.212	I	100	5139.462	I	30	5506.778	I
2000	3878.573	I	50	4225.956	I	11	5144.36	II	12	5510.78	II
4000	3886.282	I	200	4227.423	I	12	5149.46	II	12	5529.06	II
200	3887.048	I	11	4233.17	II	25	5151.910	I	13	5544.76	II
300	3888.513	I	100	4233.602	I	30	5162.27	I	30	5569.618	I
800	3895.656	I	250	4235.936	I	80	5166.281	I	60	5572.841	I
1200	3899.707	I	50	4238.809	I	2500	5167.487	I	120	5586.755	I
400	3902.945	I	50	4247.425	I	80	5168.897	I	200	5615.644	I
250	3906.479	I	200	4250.118	I	12	5169.03	II	20	5624.541	I
80	3916.731	I	300	4250.787	I	500	5171.595	I	12	5645.40	II
600	3920.258	I	40	4258.315	I	50	5191.454	I	50	5662.515	I
1200	3922.911	I	800	4260.473	I	80	5192.343	I	20	5762.990	I
1200	3927.920	I	250	4271.153	I	200	5194.941	I	11	5783.63	II
2000	3930.296	I	1200	4271.759	I	30	5204.582	I	30	5862.353	I
60	3948.774	I	1200	4282.402	I	25	5215.179	I	13	5885.02	II
60	3949.953	I	80	4291.462	I	150	5216.274	I	16	5902.82	II
50	3951.164	I	250	4299.234	I	18	5216.85	II	30	5914.114	I
50	3952.601	I	1200	4307.901	I	60	5226.862	I	14	5955.70	II
60	3956.454	I	150	4315.084	I	1000	5227.150	I	30	5986.956	I
250	3956.68	I	1500	4325.761	I	13	5227.49	II	18	5961.71	II
60	3966.614	I	80	4352.734	I	250	5232.939	I	30	5962.4	II
100	3969.257	I	80	4369.771	I	13	5247.95	II	13	5965.63	II
80	3977.741	I	800	4375.929	I	13	5251.23	II	40	6065.482	I
40	3981.771	I	3000	4383.544	I	18	5260.26	II	30	6102.159	I
50	3983.956	I	1200	4404.750	I	11	5264.18	II	40	6136.614	I
60	3994.114	I	300	4415.122	I	100	5266.555	I	40	6137.694	I
200	3997.392	I	600	4427.299	I	1200	5269.537	I	30	6147.73	II
40	3998.053	I	400	4461.652	I	800	5270.357	I	20	6149.24	II
400	4005.241	I	120	4466.551	I	30	5281.789	I	15	6175.16	II
60	4009.713	I	80	4476.017	I	60	5283.621	I	40	6191.558	I
80	4014.53	I	80	4482.169	I	25	5302.299	I	30	6213.429	I
100	4021.867	I	200	4482.252	I	11	5306.18	II	30	6219.279	I
50	4040.638	I	50	4489.739	I	13	5316.23	II	40	6230.726	I
4000	4045.813	I	50	4528.613	I	150	5324.178	I	20	6238.37	II
1500	4063.594	I	11	4583.83	II	800	5328.038	I	20	6246.317	I
50	4066.975	I	30	4647.433	I	300	5328.531	I	80	6247.56	II
50	4067.977	I	30	4736.771	I	100	5332.899	I	30	6252.554	I
1200	4071.737	I	50	4859.741	I	14	5339.59	II	15	6305.32	II
40	4076.629	I	120	4871.317	I	80	5339.928	I	12	6331.97	II
40	4100.737	I	60	4872.136	I	500	5341.023	I	15	6383.75	II
40	4107.489	I	30	4878.208	I	25	5364.87	I	20	6393.602	I

Fe I and II		
Intensity	Wavelength	
30	6399.999	I
20	6411.647	I
20	6416.90	II
20	6421.349	I
30	6430.844	I
20	6446.43	II
200	6456.38	II
60	6494.981	I
20	6516.05	II
20	6546.239	I
20	6592.913	I
40	6677.989	I
15	6855.18	I
15	6945.21	I
20	7067.44	II
15	7130.94	I
25	7164.443	I
80	7187.313	I
30	7207.381	I
12	7224.51	II
50	7307.97	II
40	7320.70	II
20	7376.46	II
30	7445.746	I
20	7462.38	II
40	7495.059	I
60	7511.045	I
15	7586.04	I
15	7711.71	II
30	7780.59	I
40	7832.22	I
80	7937.131	I
60	7945.984	I
80	7998.939	I
60	8046.047	I
50	8085.176	I
150	8220.41	I
120	8327.053	I
20	8331.908	I
120	8387.770	I
30	8468.404	I
15	8514.069	I
60	8661.898	I
150	8688.621	I
12	8793.38	I
12	8824.23	I
20	8866.96	I
15	8999.56	I
15	10216.32	I
13	10469.65	I
21	11119.80	I
14	11374.08	I
52	11422.32	I
87	11439.12	I
91	11593.59	I
255	11607.57	I
160	11638.26	I
230	11689.98	I
160	11783.26	I
580	11882.84	I
225	11884.08	I
1030	11973.05	I
15	12638.71	I
14	12879.76	I
17	13565.04	I
30	14236.25	I
24	14285.11	I
14	14292.38	I
16	14308.69	I

Fe I and II		
Intensity	Wavelength	
96	14400.56	I
20	14442.28	I
72	14512.23	I
50	14555.06	I
14	14565.95	I
40	14826.43	I
37	15051.77	I
28	15207.55	I
94	15294.58	I
16	15335.40	I
30	15621.67	I
25	15631.97	I
14	15723.59	I
41	15769.42	I
28	15813.13	I
13	16444.82	I
20	16486.69	I
105	18856.65	I
47	18987.01	I
25	19113.68	I
22	19791.88	I
14	22380.82	I
21	22619.85	I
38	26222.04	I
17	26659.22	I

Fe III		
Refs. 71,101 – J.R.		
Vacuum		
6	728.81	III
5	730.00	III
5	737.71	III
5	739.26	III
9	807.55	III
8	807.86	III
8	808.84	III
8 p	811.28	III
10	813.38	III
8	838.05	III
10	844.28	III
9	845.41	III
8 w	847.42	III
8	859.72	III
8 p	861.76	III
10 p	861.83	III
8	873.46	III
9	890.76	III
10	891.17	III
8	891.44	III
8	899.42	III
10	950.33	III
10	981.37	III
10 w	983.88	III
8	985.82	III
9	991.23	III
9	1017.25	III
8	1017.74	III
8	1018.29	III
8	1032.12	III
8	1063.87	III
9	1122.53	III
9	1124.88	III
8	1128.02	III
10 h	1505.17	III
10 h	1538.63	III
12 h	1550.20	III
10 h	1601.21	III
10	1869.83	III
12	1877.99	III

Fe III		
Intensity	Wavelength	
10	1882.05	III
12	1886.76	III
13	1890.67	III
11	1893.98	III
20	1895.46	III
10 s	1907.58	III
19	1914.06	III
15	1915.08	III
15	1922.79	III
10 p	1926.01	III
18	1926.30	III
15	1930.39	III
14	1931.51	III
14	1937.34	III
10 l	1938.90	III
14 s	1943.48	III
12	1945.34	III
10	1950.33	III
12	1951.01	III
11	1952.65	III
13	1953.32	III
10	1953.49	III
10 w	1954.22	III
11	1958.58	III
13	1960.32	III
15	1987.50	III
14	1991.61	III
13	1994.07	III
12	1995.56	III
12	1996.42	III
Air		
10	2061.55	III
12	2068.24	III
14	2078.99	III
10	2084.35	III
12	2090.14	III
15	2097.48	III
12	2097.69	III
12	2103.80	III
10	2107.32	III
15	2151.78	III
12	2157.71	III
12	2158.47	III
10	2161.27	III
12	2166.95	III
12	2171.04	III
15	2174.66	III
12	2180.41	III
10 p	2208.85	III
10	2221.83	III
10	2229.27	III
10	2232.43	III
10	2232.69	III
10	2235.91	III
10	2238.16	III
12 p	2241.54	III
12	2261.59	III
10	2267.42	III
10	2293.06	III
15	2295.86	III
10 p	2317.70	III
10	2319.22	III
10 p	2321.71	III
10	2326.95	III
10 p	2336.77	III
10	2338.96	III
8	2389.53	III
8	2438.17	III
8 p	2582.37	III

Fe III		
Intensity	Wavelength	
8	2595.62	III
8	2617.15	III
9 p	2645.39	III
10 h	2695.13	III
9 h	2695.34	III
8 h	2700.02	III
8 h	2701.13	III
8	2773.31	III
10 p	2813.24	III
8 p	2895.08	III
9 p	2902.47	III
12	2904.43	III
8 p	2905.80	III
10	2907.50	III
12	2907.70	III
8	2923.90	III
8	2948.39	III
8	2963.23	III
12	3001.62	III
12 h	3007.28	III
15	3013.17	III
10 p	3136.43	III
10	3174.09	III
10	3175.99	III
10	3178.01	III
13	3266.88	III
11	3276.08	III
10	3288.81	III
9	3305.22	III
9	3339.39	III
9	3499.59	III
9	3500.28	III
10	3501.76	III
10	3586.04	III
11	3600.94	III
11	3603.88	III
16	3954.33	III
11	3968.72	III
9	3969.49	III
10 w	3979.42	III
10	4035.42	III
11	4053.11	III
12	4081.00	III
10	4120.90	III
11	4122.02	III
11	4122.78	III
15	4137.76	III
13	4139.35	III
9	4140.48	III
9	4154.96	III
18	4164.73	III
9	4164.92	III
13	4166.84	III
13	4174.26	III
9	4210.67	III
11	4222.27	III
13	4235.56	III
9	4238.62	III
12	4243.75	III
12 h	4273.40	III
12	4279.72	III
14 h	4286.16	III
16 h	4296.85	III
18 h	4304.78	III
20 h	4310.36	III
9	4323.68	III
9 h	4372.04	III
9 h	4372.14	III
11 h	4372.31	III

Fe III

Intensity	Wavelength	
14 h	4372.53	III
18 h	4372.81	III
9	4395.76	III
12	4419.60	III
9	4431.02	III
9	5111.07	III
9	5127.35	III
12	5156.12	III
10	5199.08	III
10	5235.66	III
18	5243.31	III
13 l	5260.34	III
9	5272.37	III
14	5272.98	III
15	5276.48	III
16	5282.30	III
12	5284.83	III
11	5298.12	III
12	5299.93	III
14 w	5302.60	III
10	5306.76	III
9	5310.88	III
10	5322.74	III
11	5346.88	III
12	5353.77	III
12	5363.76	III
10	5368.06	III
11 l	5375.47	III
11	5719.88	III
9	5744.19	III
10	5756.38	III
18	5833.93	III
9	5848.76	III
10	5854.62	III
9	5876.26	III
15	5891.91	III
9	5898.68	III
9	5918.96	III
10 p	5920.13	III
18 p	5929.69	III
10	5952.31	III
14	5953.62	III
9	5968.48	III
12	5979.32	III
9 h	5981.01	III
12 h	5989.08	III
18	5999.54	III
9	6031.02	III
16	6032.59	III
13	6036.56	III
11	6048.72	III
11	6054.18	III
9	6056.36	III
9	6149.99	III
9	6169.74	III
9	6185.26	III
7	6186.56	III
7	6194.79	III
6	6195.43	III
6	6201.37	III
5 s	6203.04	III
5	6259.81	III
6 p	6294.50	III
5	6357.81	III
5 h	7317.63	III
6 h	7320.14	III
5 w	7921.17	III
5 w	8230.88	III
5 w	8231.79	III

Fe III

Intensity	Wavelength	
9 w	8235.45	III
8 w	8236.75	III
6 w	8238.98	III
5	8563.49	III

Fe IV

Ref. 382 - J.R.

Vacuum

10	502.42	IV
11	506.69	IV
11	505.35	IV
17	525.69	IV
15	526.29	IV
10	526.57	IV
13	526.63	IV
10	530.91	IV
10	531.78	IV
10	535.55	IV
14	536.61	IV
10	536.74	IV
15	537.10	IV
13	537.26	IV
14	537.79	IV
13	537.94	IV
10	538.44	IV
10	544.20	IV
10	546.22	IV
10	548.80	IV
11	550.32	IV
10	551.77	IV
13	552.14	IV
11	552.74	IV
10	554.26	IV
10	555.66	IV
10	572.88	IV
10	576.76	IV
10	579.76	IV
14	607.53	IV
13	608.80	IV
10	609.65	IV
12	1425.73	IV
13	1431.43	IV
12	1473.20	IV
12	1489.53	IV
12	1495.18	IV
13	1526.60	IV
13	1530.26	IV
14	1532.63	IV
13	1532.91	IV
15	1533.86	IV
13	1533.95	IV
14	1536.58	IV
12	1538.29	IV
13	1542.16	IV
14	1542.70	IV
12	1546.40	IV
12	1552.35	IV
12	1552.71	IV
12	1562.46	IV
13	1566.26	IV
14	1568.27	IV
12	1570.18	IV
12	1570.42	IV
12	1571.24	IV
12	1577.20	IV
12	1577.76	IV
12	1590.62	IV
13	1591.51	IV
13	1592.05	IV

Fe IV

Intensity	Wavelength	
12	1596.67	IV
13	1598.01	IV
12	1600.50	IV
13	1600.58	IV
13	1601.67	IV
12	1602.08	IV
13	1603.18	IV
13	1603.73	IV
13	1604.88	IV
13	1605.68	IV
15	1605.97	IV
13	1606.98	IV
17	1609.10	IV
14	1609.83	IV
13	1610.47	IV
13	1611.20	IV
13	1613.64	IV
15	1614.02	IV
13	1614.64	IV
13	1615.00	IV
12	1615.61	IV
16	1616.68	IV
14	1617.68	IV
14	1619.02	IV
12	1620.91	IV
13	1621.16	IV
14	1621.57	IV
13	1623.38	IV
13	1623.53	IV
15	1626.47	IV
14	1626.90	IV
13	1628.54	IV
13	1630.18	IV
17	1631.08	IV
12	1632.08	IV
14	1632.40	IV
13	1634.01	IV
12	1638.07	IV
12	1638.30	IV
14	1639.40	IV
16	1640.04	IV
14	1640.16	IV
15	1641.87	IV
12	1642.88	IV
15	1647.09	IV
15	1651.58	IV
15	1652.90	IV
13	1653.41	IV
13	1656.11	IV
15	1656.65	IV
12	1657.82	IV
12	1658.43	IV
14	1660.10	IV
12	1661.57	IV
13	1662.32	IV
13	1662.52	IV
13	1663.54	IV
13	1668.09	IV
12	1669.61	IV
14	1671.04	IV
12	1672.86	IV
13	1673.68	IV
14	1675.66	IV
12	1676.78	IV
12	1677.12	IV
13	1681.36	IV
12	1681.95	IV
15	1687.69	IV
15	1698.88	IV

Fe IV

Intensity	Wavelength	
12	1700.40	IV
12	1704.93	IV
13	1709.81	IV
15	1711.41	IV
14	1712.76	IV
12	1717.11	IV
14	1717.90	IV
14	1718.16	IV
12	1718.42	IV
14	1719.46	IV
14	1722.71	IV
14	1724.06	IV
12	1724.26	IV
16	1725.63	IV
13	1761.08	IV
12	1764.92	IV
12	1767.36	IV
13	1792.10	IV
13	1796.93	IV
12	1805.32	IV
12	1820.42	IV
13	1827.98	IV
12	1840.24	IV
12	1860.42	IV
12	1869.64	IV
12	1874.23	IV

Fe V

Ref. 381 - J.R.

Vacuum

300	361.28	V
300	365.43	V
300	365.86	V
300	374.24	V
300	374.87	V
300	375.98	V
300	379.59	V
300	380.31	V
300	381.27	V
300	384.96	V
300	384.97	V
300	385.03	V
300	385.11	V
300	385.25	V
300	385.26	V
300	385.30	V
300	385.75	V
300	385.88	V
350	386.16	V
300	386.74	V
300	386.78	V
300	386.85	V
300	386.88	V
350	386.88	V
400	387.20	V
400	387.50	V
300	387.62	V
400	387.76	V
400	387.78	V
300	387.98	V
300	388.61	V
300	388.82	V
300	390.11	V
300	390.19	V
300	390.78	V
300	391.94	V
300	392.06	V
300	392.38	V
300	392.50	V

Fe V		
Intensity	Wavelength	
300	392.51	V
300	392.70	V
300	392.91	V
300	393.27	V
300	393.72	V
300	393.73	V
300	393.91	V
300	393.97	V
300	394.04	V
300	394.64	V
300	395.15	V
300	395.79	V
400	395.90	V
300	399.84	V
300	400.11	V
300	400.51	V
300	400.52	V
300	400.63	V
300	401.04	V
300	401.64	V
300	401.86	V
300	402.87	V
300	403.06	V
400	404.62	V
400	405.50	V
800	407.42	V
600	407.44	V
400	407.49	V
500	407.75	V
400	409.71	V
400	410.20	V
600	411.55	V
300	415.01	V
300	416.66	V
300	416.84	V
700	417.39	V
700	418.04	V
500	418.47	V
300	420.56	V
700	421.06	V
500	421.78	V
300	422.28	V
500	422.31	V
300	423.23	V
500	426.06	V
500	426.11	V
300	426.83	V
350	426.97	V
300	434.42	V
300	439.22	V
300	444.70	V
300	445.44	V
300	446.04	V
300	458.16	V
300	486.17	V
400	1317.86	V
300	1318.35	V
300	1320.41	V
300	1321.34	V
300	1321.49	V
400	1323.27	V
400	1330.40	V
300	1345.61	V
400	1359.01	V
300	1361.28	V
300	1361.45	V
600	1361.82	V
300	1363.08	V
300	1363.64	V

Fe V		
Intensity	Wavelength	
300	1365.57	V
700	1373.59	V
600	1373.67	V
300	1374.12	V
500	1376.34	V
300	1376.46	V
500	1378.56	V
300	1385.68	V
800	1387.94	V
400	1397.97	V
600	1400.24	V
800	1402.39	V
400	1406.67	V
500	1406.82	V
400	1407.25	V
300	1409.03	V
300	1409.22	V
600	1409.45	V
400	1415.20	V
300	1418.12	V
600	1420.46	V
800	1430.57	V
800	1440.53	V
300	1440.79	V
400	1442.22	V
800	1446.62	V
700	1448.85	V
400	1449.93	V
300	1455.56	V
700	1456.16	V
500	1459.83	V
400	1460.73	V
500	1462.63	V
700	1464.68	V
500	1465.38	V
400	1466.65	V
500	1469.00	V
300	1475.60	V
500	1479.47	V
300	1554.22	V

KRYPTON (Kr)

Z = 36

Kr I and II Refs. 61,121,123,147, 208,232 - E.F.W. Vacuum		
60	729.40	II
200	761.18	II
100	763.98	II
60	766.20	II
200	771.03	II
60 p	773.69	II
200	782.10	II
100	783.72	II
60	818.15	II
60	830.38	II
100	844.06	II
60	864.82	II
60	868.87	II
200	884.14	II
1000	886.30	II
400	891.01	II
200	911.39	II
2000	917.43	II
50	945.44	I
50	946.54	I

Kr I and II		
Intensity	Wavelength	
20	951.06	I
50	953.40	I
50	963.37	I
2000	964.97	II
100	1001.06	I
100	1003.55	I
100	1030.02	I
200	1164.87	I
650	1235.84	I
	Air	
100 h	2464.77	II
60	2492.48	II
80 h	2712.40	II
100	2833.00	II
100 h	3607.88	II
200	3631.889	II
250	3653.928	II
80	3665.324	I
150	3669.01	II
100	3679.559	I
80	3686.182	II
300 h	3718.02	II
200	3718.595	II
150	3721.350	II
200	3741.638	II
150	3744.80	II
80	3754.245	II
500	3778.089	II
500	3783.095	II
150 h	3875.44	II
150	3906.177	II
200	3920.081	II
100	3994.840	II
100 h	3997.793	II
300	4057.037	II
300	4065.128	II
500	4088.337	II
250	4098.729	II
100	4109.248	II
250	4145.122	II
150	4250.580	II
1000	4273.969	I
100	4282.967	I
600	4292.923	II
200	4300.49	II
500 h	4317.81	II
400	4318.551	I
1000	4319.579	I
150 h	4322.98	II
100	4351.359	I
3000	4355.477	II
500	4362.641	I
200	4369.69	II
800	4376.121	I
300 h	4386.54	II
200	4399.965	I
100	4425.189	I
500	4431.685	II
600	4436.812	II
600	4453.917	I
800	4463.689	I
800	4475.014	II
400 h	4489.88	II
600	4502.353	I
400 h	4523.14	II
200 h	4556.61	II
800	4577.209	II
300	4582.978	II
150 h	4592.80	II

Kr I and II		
Intensity	Wavelength	
500	4615.292	II
1000	4619.166	II
800	4633.885	II
2000	4658.876	II
500	4680.406	II
100	4691.301	II
200	4694.360	II
3000	4739.002	II
300	4762.435	II
1000	4765.744	II
300	4811.76	II
300	4825.18	II
800	4832.077	II
700	4846.612	II
150	4857.20	II
300	4945.59	II
200	5022.40	II
250	5086.52	II
400 h	5125.73	II
500	5208.32	II
200	5308.66	II
500	5333.41	II
200	5468.17	II
500	5562.224	I
2000	5570.288	I
80	5580.386	I
100	5649.561	I
400	5681.89	II
200 h	5690.35	II
100	5832.855	I
3000	5870.914	I
200	5992.22	II
60	5993.849	I
60	6056.125	I
300	6420.18	II
100	6421.026	I
200	6456.288	I
150	6570.07	II
60	6699.228	I
100	6904.678	I
250	7213.13	II
100	7224.104	I
80	7287.258	I
400	7289.78	II
400	7407.02	II
60	7425.541	I
200	7435.78	II
100	7486.862	I
300	7524.46	II
1000	7587.411	I
2000	7601.544	I
150	7641.16	II
1000	7685.244	I
1200	7694.538	I
250	7735.69	II
150	7746.827	I
800	7854.821	I
200	7913.423	I
180	7928.597	I
200	7933.22	II
120	7973.62	II
100	7982.401	I
1500	8059.503	I
4000	8104.364	I
6000	8112.899	I
60	8132.967	I
3000	8190.054	I
200	8202.72	II
80	8218.365	I

Kr I and II

Intensity	Wavelength	
3000	8263.240	I
100	8272.353	I
5000	8298.107	I
1500	8281.050	I
100	8412.430	I
3000	8508.870	I
150	8764.110	I
6000	8776.748	I
2000	8928.692	I
500	9238.48	II
500 h	9293.82	II
200 h	9320.99	II
300	9361.95	II
100	9362.082	I
200 h	9402.82	II
200 h	9470.93	II
500	9577.52	II
500 h	9605.80	II
400 h	9619.61	II
200	9663.34	II
200 h	9711.60	II
2000	9751.758	I
500	9803.14	II
500	9856.314	I
1000	10221.46	II
100	11187.108	I
200	11257.711	I
150	11259.126	I
500	11457.481	I
150	11792.425	I
1500	11819.377	I
600	11997.105	I
160	12077.224	I
100	12861.892	I
1100	13177.412	I
1000	13622.415	I
2400	13634.220	I
800	13658.394	I
200	13711.036	I
600	13738.851	I
150	13974.027	I
550	14045.657	I
140	14104.298	I
180	14402.22	I
2000	14426.793	I
100	14517.84	I
1600	14734.436	I
550	14762.672	I
450	14765.472	I
400	14961.894	I
120	15005.307	I
140	15209.526	I
1700	15239.615	I
130	15326.480	I
1500	15334.958	I
700	15372.037	I
200	15474.026	I
180	15681.02	I
120	15820.09	I
200	16726.513	I
2000	16785.128	I
1000	16853.488	I
2400	16890.441	I
1600	16896.753	I
1800	16935.806	I
600	17098.771	I
700	17367.606	I
120	17404.443	I
150	17616.854	I

Kr I and II

Intensity	Wavelength	
650	17842.737	I
700	18002.229	I
2600	18167.315	I
100	18399.786	I
150	18580.896	I
300	18696.294	I
170	18785.460	I
200	18797.703	I
140	20209.878	I
300	20423.964	I
140	20446.971	I
600	21165.471	I
1800	21902.513	I
120	22485.775	I
180	23340.416	I
120	24260.506	I
180	24292.221	I
600	25233.820	I
180	28610.55	I
1000	28655.72	I
150	28769.71	I
140	28822.49	I
300	29236.69	I
300	30663.54	I
300	30979.16	I
500	39300.6	I
1100	39486.52	I
220	39557.25	I
100	39572.60	I
1400	39588.4	I
1100	39589.6	I
500	39954.8	I
300	39966.6	I
1300	40306.1	I
250	40685.16	I

Kr III

Refs. 208,366,390,421 – E.F.W.

Vacuum

30	467.35	III
30	540.86	III
30	565.64	III
30	569.16	III
30	571.98	III
30	579.83	III
30	585.14	III
30	585.96	III
30	593.70	III
30	594.10	III
30	596.41	III
40	600.17	III
30	603.67	III
50	605.86	III
35	606.47	III
50	611.12	III
35	616.72	III
40	621.45	III
45	622.80	III
50	625.02	III
30	625.76	III
45	628.59	III
50	630.04	III
35	633.09	III
50	639.98	III
60	646.41	III
50	651.20	III
50	659.72	III
30	664.86	III

Kr III

Intensity	Wavelength	
40	672.34	III
35	672.85	III
35	676.57	III
35	680.13	III
35	683.68	III
45	686.25	III
45	687.98	III
45	691.93	III
50	695.61	III
30	698.05	III
50	708.36	III
50	714.00	III
100 p	722.04	III
30	746.70	III
60	785.97	III
50	837.66	III
50	854.73	III
60	862.58	III
40	870.84	III
50	876.08	III
75	897.81	III
50	987.29	III
30	1158.74	III
6	1638.82	III
6	1914.09	III

Air

40	2393.94	III
40	2494.01	III
30	2563.25	III
60	2639.76	III
30	2680.32	III
40	2681.19	III
30	2841.00	III
30	2851.16	III
50	2870.61	III
100	2892.18	III
30	2909.17	III
50	2952.56	III
60	2992.22	III
50	3022.30	III
80	3024.45	III
50	3046.93	III
30	3056.72	III
60	3063.13	III
40	3097.16	III
60	3112.25	III
30	3120.61	III
100	3124.39	III
60	3141.35	III
100	3189.11	III
80	3191.21	III
40	3239.52	III
40	3240.44	III
300	3245.69	III
150	3264.81	III
100	3268.48	III
30	3271.65	III
30	3285.89	III
30	3304.75	III
50	3311.47	III
200	3325.75	III
60	3330.76	III
50	3342.48	III
100	3351.93	III
40	3374.96	III
100	3439.46	III
70	3474.65	III
100	3488.59	III
200	3507.42	III

Kr III

Intensity	Wavelength	
100	3564.23	III
30	3641.34	III
30	3690.65	III
40 h	3868.70	III
50	4067.37	III
40	4131.33	III
40	4154.46	III
20 h	5016.45	III
10	5501.43	III
10 h	6037.17	III
10 h	6078.38	III
10	6310.22	III

Kr IV

Refs. 366,409,417 – E.F.W.

Vacuum

	793.44	IV
	794.11	IV
7	805.76	IV
18	816.82	IV
22	842.04	IV

Air

3	2237.34	IV
6	2291.26	IV
3	2329.3	IV
4	2336.75	IV
4	2348.27	IV
3	2358.5	IV
3	2388.05	IV
4	2416.9	IV
3	2428.04	IV
5	2442.68	IV
4	2451.7	IV
6	2459.74	IV
5	2474.06	IV
4	2517.0	IV
5	2518.02	IV
6	2519.38	IV
5	2524.5	IV
5	2546.0	IV
6	2547.0	IV
4	2558.08	IV
3	2586.9	IV
5	2606.17	IV
10	2609.5	IV
8	2615.3	IV
7	2621.11	IV
3	2730.55	IV
8	2748.18	IV
6	2774.70	IV
3	2829.60	IV
3	2836.08	IV
5	2853.0	IV
3	2859.3	IV
3	3142.01	IV
6	3224.99	IV
3	3261.70	IV
3	3809.30	IV
5	3860.58	IV
5	3934.29	IV

Kr V

Refs. 409,421 – E.F.W.

Vacuum

150	472.16	V
100	484.39	V
250	496.25	V
120	500.77	V
200	507.20	V
60	548.04	V

Kr V		
Intensity	Wavelength	
120	637.87	V
	690.86	V
	691.75	V
600	708.85	V
	810.70	V

LANTHANUM (La)

Z = 57

La I and II Ref. 1 - C.H.C. Air		
240	2187.87	II
770	2256.76	II
200	2319.44	II
400	2610.34	II
420	2808.39	II
130	2885.14	II
160	2893.07	II
110	2950.50	II
180	3104.59	II
130	3142.76	II
510	3245.13	II
260	3249.35	II
550	3265.67	II
800	3303.11	II
1500	3337.49	II
870	3344.56	II
200	3376.33	II
1500	3380.91	II
130	3452.18	II
180	3453.17	II
200	3574.43	I
320	3628.83	II
120	3637.15	II
170 d	3641.53	I
	3641.66	II
1000	3645.42	II
390	3650.18	II
170	3662.08	II
120	3704.54	I
320	3705.82	II
550	3713.54	II
140	3714.87	II
270	3715.53	II
2400	3759.08	II
120	3780.67	II
3700	3790.83	II
3900	3794.78	II
190	3835.08	II
600	3840.72	II
120	3846.00	II
1600	3849.02	II
130	3854.91	II
3400	3871.64	II
1700	3886.37	II
1300	3916.05	II
1100	3921.54	II
160	3927.56	I
2200	3929.22	II
180	3936.22	II
9000	3949.10	II
4400	3988.52	II
3600	3995.75	II
180	4015.39	I
250	4025.88	II
2800	4031.69	II
140	4037.21	I

La I and II		
Intensity	Wavelength	
3000	4042.91	II
320	4050.08	II
220	4060.33	I
160	4064.79	I
850	4067.39	II
110	4076.71	II
2800	4077.35	II
120	4079.18	I
5500	4086.72	II
180	4089.61	I
280	4099.54	II
110	4104.87	I
4400	4123.23	II
110	4137.04	I
550	4141.74	II
1100	4151.97	II
220	4152.78	II
100	4160.26	I
280	4187.32	I
280	4192.36	II
1500	4196.55	II
240	4204.04	II
300	4217.56	II
200	4230.95	II
1600	4238.38	II
140	4249.99	II
320	4263.59	II
480	4269.50	II
240	4275.64	II
300	4280.27	I
600	4286.97	II
600	4296.05	II
120	4300.44	II
440	4322.51	II
4600	4333.74	II
550	4354.40	II
110	4364.67	II
110bl	4371.97	LaO
110bl	4375.84	LaO
110	4378.10	II
280	4383.44	II
100	4385.20	II
220bl	4418.24	LaO
160bl	4423.17	LaO
160	4423.90	I
260	4427.55	II
100bl	4428.10	LaO
2000	4429.90	II
160bl	4432.98	LaO
100bl	4438.01	LaO
100	4452.15	I
100	4455.80	II
850	4522.37	II
170	4525.31	II
420	4526.12	II
400	4558.46	II
110	4559.29	II
160	4567.91	I
200	4570.02	I
400	4574.88	II
200	4580.06	II
160	4605.78	II
410	4613.39	II
410	4619.88	II
110	4645.28	II
540	4655.50	II
360	4662.51	II
230	4663.76	II
200	4668.91	II

La I and II		
Intensity	Wavelength	
160	4671.83	II
230	4692.50	II
140	4703.28	II
170	4716.44	II
140	4719.94	II
230	4728.42	II
500	4740.28	II
390	4743.09	II
320	4748.73	II
160	4766.89	I
160	4804.04	II
160	4809.01	II
200	4824.06	II
320	4860.91	II
850	4899.92	II
1000	4920.98	II
1000	4921.79	II
140	4934.83	II
110	4946.47	II
370	4949.77	I
340	4970.39	II
370	4986.83	II
140	4991.28	II
720	4999.47	II
140	5046.88	I
210	5050.57	I
170	5056.46	I
200	5106.23	I
470	5114.56	II
470	5122.99	II
450	5145.42	I
180	5156.74	II
180	5157.43	II
290	5158.69	I
120	5163.62	II
580	5177.31	I
850	5183.42	II
260	5188.22	II
170	5204.15	II
720	5211.86	I
520	5234.27	I
340	5253.46	I
110	5259.39	II
370	5271.19	I
140	5290.84	II
370	5301.98	II
140	5302.62	II
180	5303.55	II
110	5340.67	II
110	5357.86	I
130	5377.09	II
140	5380.99	II
500	5455.15	I
470	5501.34	I
110bl	5602.50	LaO
160	5631.22	I
240	5648.25	I
130	5657.72	I
180	5740.66	I
160	5744.41	I
160	5761.84	I
160	5769.07	II
370	5769.34	I
320	5789.24	I
450	5791.34	I
220	5797.58	II
160	5805.78	II
140	5821.99	I
320	5930.62	I

La I and II		
Intensity	Wavelength	
720	6249.93	I
260 d	6262.30	II
180	6296.09	II
160	6320.39	II
110	6325.91	I
170	6390.48	II
450	6394.23	I
210	6410.99	I
250	6455.99	I
110	6526.99	II
130	6543.16	I
140	6578.51	I
180	6709.50	I
120	6774.26	II
13 b	7011.22	LaO
75	7023.67	I
26	7032.05	I
26 b	7040.84	LaO
110	7045.96	I
13 b	7054.80	LaO
160	7066.23	II
65	7068.37	I
21bl	7070.79	LaO
13	7076.38	I
21bl	7085.40	LaO
26bl	7101.02	LaO
10 h	7116.8	II
19bl	7131.58	LaO
10	7149.77	I
40 h	7158.08	I
50	7161.25	I
10	7162.60	LaO
21	7219.91	I
10 b	7257.16	LaO
26	7270.09	I
10	7270.30	I
110cw	7282.34	II
10	7320.91	I
110cw	7334.18	I
65	7345.34	I
50bl	7379.71	LaO
85bl	7380.08	LaO
35	7382.73	I
110bl	7403.52	LaO
210bl	7403.75	LaO
50 b	7411.34	LaO
65bl	7434.28	LaO
110bl	7434.36	LaO
30 b	7442.92	LaO
50 h	7463.08	I
50bl	7465.25	LaO
95bl	7465.48	LaO
75cw	7483.50	II
40bl	7496.50	LaO
95bl	7496.78	LaO
50	7498.83	I
30 b	7506.79	LaO
19bl	7528.21	LaO
50bl	7528.39	LaO
30	7533.59	I
85	7539.23	I
35bl	7560.09	LaO
35bl	7592.26	LaO
19 h	7612.94	II
19 b	7624.99	LaO
21	7664.34	I
15 h	7841.80	I
21 b	7876.87	LaO
75bl	7877.22	LaO

La I and II

Intensity	Wavelength	
75bl	7910.19	LaO
150bl	7910.54	LaO
50 b	7944.61	LaO
110bl	7944.95	LaO
40	7964.83	I
35 b	7979.34	LaO
75bl	7979.70	LaO
35 h	8001.89	I
21 b	8014.43	LaO
65bl	8014.79	LaO
30 b	8019.48	LaO
35hc	8051.39	I
75	8086.05	I
15 b	8122.20	LaO
15 b	8159.02	LaO
7 h	8203.38	I
50	8247.44	I
13 h	8316.04	I
85	8324.69	I
95	8346.53	I
8 h	8379.80	I
8 b	8453.55	LaO
8 h	8467.62	I
26	8476.48	I
13 h	8507.37	I
13 h	8513.57	I
8 h	8514.65	II
17 b	8526.59	LaO
17 c	8543.46	I
65	8545.44	I
15 b	8563.54	LaO
9 h	8590.94	I
9 b	8600.81	LaO
7 h	8624.22	I
15	8638.47	I
19hw	8672.11	I
40	8674.43	I
13 h	8720.41	I
35	8748.38	I
19	8818.93	I
35	8825.82	I
21	8839.63	I

La III

Refs. 220,309 - J.R.
Vacuum

3	744.19	III
10	753.03	III
1	786.64	III
200	787.14	III
1	796.03	III
400	796.99	III
1	797.20	III
10	835.03	III
30	845.62	III
1	850.73	III
1	860.39	III
2	860.88	III
5	865.04	III
2000	870.40	III
30	872.43	III
1000	882.34	III
20	882.72	III
200	929.71	III
400	942.86	III
30	967.69	III
10	974.33	III
50	979.99	III
10	980.29	III

La III

Intensity	Wavelength	
200	1058.63	III
1000	1072.59	III
5000	1076.91	III
50000	1081.61	III
95000	1099.73	III
5000	1100.70	III
30	1208.80	III
30	1212.29	III
200	1236.54	III
100	1253.99	III
2000	1255.63	III
100	1259.55	III
100	1322.42	III
5000	1330.04	III
10000	1349.18	III
5000	1459.49	III
2000	1466.44	III
10000	1523.79	III
500	1528.55	III
5000	1536.17	III
200	1923.34	III
500	1938.57	III
	Air	
60	2216.07	III
20	2238.36	III
25	2258.61	III
5	2260.30	III
250	2297.74	III
400	2379.37	III
10	2387.99	III
20	2392.49	III
100	2476.60	III
50	2478.65	III
2	2513.43	III
4	2588.87	III
2	2604.83	III
400	2651.50	III
100	2682.34	III
150	2684.76	III
110	2897.88	III
160	2904.58	III
7	2950.84	III
10	2953.77	III
40	2992.10	III
4	3006.19	III
15	3009.22	III
100	3075.17	III
4	3085.38	III
25	3093.03	III
15	3096.26	III
200	3111.97	III
50	3116.74	III
1000	3171.63	III
1500	3171.74	III
50	3172.69	III
20	3196.84	III
70	3289.11	III
15	3301.48	III
35	3327.66	III
500	3517.09	III
600	3517.22	III
3	4129.24	III
5	4137.43	III
200	4482.97	III
300	4499.05	III
5	5145.73	III
8	5158.41	III
6	5467.81	III
55	5491.90	III

La III

Intensity	Wavelength	
2	5511.72	III
1	5518.19	III
45	5529.54	III
1	5744.09	III
200	5778.14	III
2	5813.45	III
3	5875.63	III
55	5888.62	III
3	5932.71	III
2	6017.11	III
20	6055.84	III
35	6119.25	III
120	6141.99	III
55	6220.00	III
60	6348.21	III
3	8114.42	III
2	8135.96	III
250	8252.60	III
100	8275.39	III
200	8287.75	III
250	8321.11	III
300	8583.45	III
120	9184.38	III
100	9212.63	III
80	9923.99	III
140	10284.79	III
20	10370.34	III
12	10937.90	III

La IV

Ref. 79 - J.R.
Vacuum

100	344.12	IV
7000	453.50	IV
10000	463.14	IV
15000	499.54	IV
40000	552.02	IV
30000	631.26	IV
25	724.92	IV
15	733.29	IV
10	797.03	IV
10 c	980.03	IV
50	1039.30	IV
60 p	1062.09	IV
75	1158.35	IV
50	1164.29	IV
400	1230.90	IV
75 p	1260.79	IV
300	1261.12	IV
150	1283.19	IV
2000	1302.31	IV
1200	1333.53	IV
3500	1334.96	IV
1000	1352.76	IV
25000	1368.04	IV
8000	1377.49	IV
3000	1394.32	IV
5000	1414.58	IV
7000	1432.55	IV
7000	1441.63	IV
7500	1462.15	IV
20000	1463.47	IV
7500	1467.54	IV
15000	1507.87	IV
5000	1527.19	IV
2500	1575.92	IV
1500	1583.61	IV
750	1585.11	IV
750	1637.42	IV

La IV

Intensity	Wavelength	
750 d	1645.21	IV
1000	1664.84	IV
750	1684.17	IV
2000 p	1767.65	IV
4000	1808.66	IV
1000	1851.81	IV
1500	1852.77	IV
750	1879.79	IV
1000	1881.57	IV
800	1889.22	IV
1000	1891.47	IV
5000	1902.97	IV
800	1907.44	IV
1500 c	1950.80	IV
1200 c	1957.57	IV
	Air	
3000	2012.42	IV
750	2037.43	IV
2000 c	2066.50	IV
3000 c	2073.18	IV
1500	2143.23	IV
4000 c	2197.45	IV
1000 w	2221.12	IV
900	2227.34	IV
3000	2244.95	IV
7500 w	2265.91	IV
2000	2315.89	IV
750	2348.36	IV
750	2355.31	IV
2000 c	2407.10	IV
25000 w	2417.58	IV
1200 p	2443.92	IV
18000 c	2502.81	IV
15000	2515.02	IV
50000	2532.75	IV
900 d	2535.76	IV
45000	2582.05	IV
18000 c	2591.30	IV
95000 w	2597.50	IV
5000 c	2608.01	IV
70000 w	2662.75	IV
50000 w	2848.30	IV
12000 c	2863.30	IV
30000 c	2962.58	IV
70000 w	3009.51	IV
90000 c	3056.68	IV
3500	3522.28	IV
2000	3650.40	IV
2000 p	4270.76	IV
1500 w	4549.80	IV
500	4836.89	IV

La V

Ref. 78 - J.R.
Vacuum

2	389.03	V
400	390.72	V
1	398.53	V
30	399.34	V
350	405.10	V
50	416.13	V
3	421.55	V
50	423.07	V
400	424.78	V
1000	432.11	V
2500	435.28	V
700	436.14	V
700	436.84	V
300	437.11	V

La V

Intensity	Wavelength	
700	437.55	V
20	444.01	V
10	444.07	V
1250	450.40	V
600	457.30	V
1000	463.85	V
150	476.67	V
5000	482.16	V
200	482.43	V
2000	483.30	V
7000	498.08	V
4000	499.03	V
10000	503.58	V
40	508.15	V
1500	525.71	V
12000	526.76	V
10000	531.07	V
15000	533.23	V
4000	540.20	V
6000	544.80	V
8000	547.44	V
3000	570.90	V
2500	593.18	V
750	597.70	V
2000	600.01	V
5000	600.24	V
700	611.70	V
500	617.60	V

LEAD (Pb)

Z = 82

Pb I and II

Refs. 64,274,283,329,330 - D.R.W

Vacuum

2	846.04	II
2 h	849.88	II
3	855.57	II
3	863.00	II
6	873.71	II
2	877.96	II
8	889.68	II
3	896.30	II
5	926.44	II
2	958.76	II
2	960.21	II
3	965.36	II
10	967.23	II
9	972.56	II
8	982.17	II
10	986.71	II
10	995.89	II
6	1001.81	II
10	1016.61	II
10	1049.82	II
10	1050.77	II
10	1060.66	II
9	1065.58	II
10	1103.94	II
10	1108.43	II
10	1109.84	II
10	1119.57	II
10	1121.36	II
10	1133.14	II
4	1145.91	II
10	1203.63	II
10	1231.20	II

Pb I and II

Intensity	Wavelength	
10	1331.65	II
10	1335.20	II
10	1348.37	II
10	1433.96	II
3	1449.35	II
10	1512.42	II
10	1671.53	II
10	1682.15	II
20	1726.75	II
2	1740.00	I
2	1766.64	I
2	1794.67	I
10	1796.670	II
5	1812.97	I
10	1822.050	II
4	1868.76	I
10	1904.77	I
7	1921.471	II
4	1972.44	I
2	1977.88	I
2	1991.60	I
2	1992.31	I
	Air	
5 r	2022.02	I
5	2050.88	I
8 r	2053.28	I
6	2111.758	I
10	2115.066	I
500 r	2170.00	I
7	2175.580	I
7	2187.888	I
8	2189.603	I
10	2203.534	II
20	2237.425	I
20	2246.86	I
25	2246.89	I
150	2332.418	I
180	2388.797	I
550 r	2393.792	I
140	2399.597	I
320 r	2401.940	I
320 r	2411.734	I
150 r	2443.829	I
160 r	2446.181	I
130 r	2476.378	I
8 c	2526.69	II
8 c	2576.60	II
80 r	2577.260	I
2 c	2608.38	II
500 r	2613.655	I
900 r	2614.175	I
160	2628.262	I
4	2634.256	II
10	2657.094	I
700	2663.154	I
10	2697.541	I
25000 r	2801.995	I
100	2822.58	I
14000 r	2823.189	I
35000 r	2833.053	I
6	2840.557	II
14000 r	2873.311	I
3 c	2887.30	II
3	2914.442	II
2 c	2947.43	II
3 c	2948.53	II
15	2966.460	I
15	2972.991	I
15	2980.157	I

Pb I and II

Intensity	Wavelength	
4	2986.876	II
10 c	3016.39	II
150	3118.894	I
600	3220.528	I
100	3229.613	I
400	3240.186	I
200	3262.355	I
35000	3572.729	I
50000 r	3639.568	I
20000	3671.491	I
70000 r	3683.462	I
10	3713.982	II
25000	3739.935	I
15000	4019.632	I
95000	4057.807	I
14000	4062.136	I
5	4110.76	II
4	4113.35	II
10	4152.82	II
10	4157.814	I
10000	4168.033	I
9 c	4242.14	II
20 c	4244.92	II
7	4293.82	II
6	4296.65	II
200	4340.413	I
10	4352.74	II
20 c	4386.46	II
10	4579.051	II
10	4582.27	II
1000	5005.416	I
100	5006.572	I
50	5042.58	II
10	5070.58	II
10	5074.53	II
10	5076.35	I
50	5089.484	I
20	5090.01	I
10	5107.242	I
10	5111.64	II
2000	5201.437	I
10	5367.64	II
10	5372.099	II
10 c	5544.25	II
20 c	5608.85	II
40	5692.346	I
200	5895.624	I
2000	6001.862	I
9 c	6009.58	II
500	6011.667	I
8 c	6041.17	II
500	6059.356	I
40	6075.74	II
40	6081.409	II
50	6110.520	I
10	6159.89	II
100	6235.266	I
50 c	6660.20	II
10	6892.11	I
5	7128.94	I
20	7193.60	II
20000	7228.965	I
5	7304.68	I
8	7330.15	I
10	7346.676	I
10	7558.97	II
10	7632.56	II
4	7732.96	II
20	7809.259	I

Pb I and II

Intensity	Wavelength	
5	7817.97	I
6	7829.01	I
5	7896.737	I
2 d	8156.91	II
10	8168.001	I
6	8191.886	I
5	8217.711	I
8	8255.61	I
40	8272.690	I
6	8335.54	II
10	8395.68	II
20	8409.384	I
10	8478.492	I
8	8532.17	I
7 c	8544.95	II
7	8709.90	II
5	8719.39	II
5	8722.810	I
10	8857.457	I
10	9050.82	II
10	9063.43	II
2 d	9245.28	II
8	9293.476	I
5	9384.35	I
5	9385.89	I
15	9438.05	I
15	9604.297	I
6	9608.73	I
15	9674.351	I
200	10290.458	I
5	10434.32	I
100	10498.965	I
50	10649.249	I
5	10759.41	I
7	10759.74	I
15	10886.688	I
40	10969.53	I
6	11059.22	I
3	11333.08	I
2 d	11479.49	II
2	11488.76	I
5	11627.91	II
1	12561.37	I
	13495.3	I
	13498.2	I
	13512.6	I
	14722.8	I
	14742.1	I
	14743.0	I
	15314.8	I
	15327.6	I
	15331.0	I
	15349.6	I
	38831.1	I
	38950.1	I
	38958.6	I
	39039.4	I

Pb III

Refs. 54,256,297 - D.R.W.

Vacuum

1	961.01	III
3	1030.5	III
12	1048.9	III
4	1069.2	III
3	1074.7	III
4	1118.67	III
4	1167.0	III
4	1250.6	III

Pb III		
Intensity	Wavelength	
1	1266.9	III
20	1553.1	III
1	1610.1	III
4	1711.23	III
	Air	
10	3043.85	III
4	3089.08	III
4	3102.74	III
10	3137.81	III
10	3176.50	III
5	3242.84	III
1	3530.17	III
7	3589.87	III
7	3689.31	III
3	3706.02	III
5	3728.69	III
12	3854.08	III
8	3951.92	III
3	4031.16	III
3	4094.54	III
2	4128.11	III
8	4272.66	III
6	4499.34	III
7	4571.21	III
1	4596.45	III
6	4761.12	III
4	4798.59	III
1	4826.86	III
2	4855.06	III
3	5065.12	III
4	5191.56	III
5	5523.97	III
3	5779.41	III
6	5857.96	III

Pb IV		
Ref. 106 - D.R.W.		
Vacuum		
8	475.36	IV
7	478.35	IV
10	496.38	IV
12	499.94	IV
9	515.07	IV
14	529.78	IV
20	570.16	IV
8	573.90	IV
8	584.52	IV
10	648.50	IV
9	656.10	IV
10	761.09	IV
18	802.07	IV
12	802.82	IV
10	812.59	IV
8	822.07	IV
10	827.41	IV
12	832.60	IV
8	840.99	IV
8	842.88	IV
12	845.94	IV
18	857.64	IV
8	859.02	IV
16	862.33	IV
14	870.44	IV
12	879.96	IV
7	880.35	IV
14	884.96	IV
14	884.99	IV
16	890.72	IV
12	908.51	IV

Pb IV		
Intensity	Wavelength	
12	917.90	IV
10	922.12	IV
12	922.49	IV
7	924.52	IV
10	927.64	IV
14	932.20	IV
8	937.00	IV
7	952.85	IV
8	1012.44	IV
14	1028.61	IV
20	1032.05	IV
16	1041.24	IV
18	1044.14	IV
15	1056.53	IV
12	1072.09	IV
7	1079.88	IV
18	1080.81	IV
20	1084.17	IV
6	1089.94	IV
7	1099.47	IV
6	1115.30	IV
20	1116.08	IV
18	1137.84	IV
8	1142.77	IV
14	1144.93	IV
20	1189.95	IV
8	1267.55	IV
8	1290.82	IV
10	1291.10	IV
20	1313.05	IV
8	1323.92	IV
12	1343.06	IV
16	1388.94	IV
6	1397.02	IV
18	1400.26	IV
10	1404.34	IV
7	1510.76	IV
14	1535.71	IV
8	1798.39	IV
8	1893.19	IV
12	1959.34	IV
16	1973.16	IV
	Air	
10	2042.58	IV
12	2049.34	IV
12	2079.22	IV
8	2151.96	IV
15	2154.01	IV
12	2177.46	IV
16	2359.53	IV
4	2864.24	IV
4	2864.50	IV
16	2417.61	IV
4	2978.14	IV
4	3052.56	IV
4	3221.17	IV
4	3962.48	IV
4	4049.80	IV
10	4496.15	IV
16	4534.60	IV
8	4605.40	IV
2	5914.54	IV

Pb V		
Ref. 106 - D.R.W.		
Vacuum		
2	367.40	V
2	372.53	V
2	387.87	V

Pb V		
Intensity	Wavelength	
2	394.38	V
5	424.64	V
3	431.03	V
3	436.60	V
2	438.47	V
6	438.91	V
4	453.45	V
3	461.70	V
3	496.20	V
4	694.42	V
8	696.20	V
20	703.73	V
4	706.29	V
6	707.66	V
5	730.85	V
12	749.46	V
10	752.52	V
10	755.80	V
6	762.76	V
10	765.87	V
18	767.45	V
18	769.49	V
14	771.42	V
14	782.79	V
10	787.05	V
15	797.02	V
5	799.80	V
18	809.63	V
5	812.32	V
8	814.10	V
8	820.09	V
5	825.52	V
8	829.32	V
5	851.98	V
20	863.97	V
10	867.10	V
6	880.50	V
18	883.90	V
14	888.37	V
14	894.40	V
12	896.08	V
8	915.09	V
14	915.71	V
12	918.09	V
12	920.28	V
12	920.66	V
6	940.74	V
8	946.20	V
6	950.93	V
12	954.35	V
4	954.95	V
10	955.28	V
4	964.38	V
6	989.14	V
8	1005.42	V
10	1051.26	V
4	1059.26	V
10	1088.86	V
9	1096.52	V
6	1104.79	V
4	1121.33	V
10	1137.50	V
4	1152.36	V
12	1157.88	V
14	1185.43	V
11	1233.50	V
10	1248.47	V
8	1635.75	V
2	1802.87	V

Pb V		
Intensity	Wavelength	
2	1843.00	V
2	1888.67	V
2	1897.02	V
2	1914.33	V
4	1919.74	V
5	1957.96	V
2	1998.58	V
10	1998.83	V
	Air	
8	2078.45	V
10	2142.55	V
10	2167.97	V
20	2259.01	V
10	2276.66	V
8	2301.49	V
15	2424.81	V
4	4809.36	V
5	6650.99	V
4	6753.20	V

LITHIUM (Li)

Z = 3

Li I and II

Refs. 3,15,17,18,37,41,112, 284,321,335 - J.O.S.

Vacuum	
125.5	II
136.5	II
140.5	II
167.21	II
168.74	II
171.58	II
178.02	II
199.28	II
207.5	II
456.	II
483.	II
540.	II
729.	II
800.	II
820.	II
861.	II
905.5	II
917.5	II
936.	II
945.	II
965.	II
972.	II
988.	II
1018.	II
1032.	II
1036.	II
1093.	II
1103.	II
1109.	II
1116.	II
1132.1	II
1141.	II
1166.4	II
1198.09	II
1215.	II
1238.	II
1253.8	II
1420.89	II
1424.	II
3 1492.93	II
5 1492.97	II

Li I and II

Intensity	Wavelength	
1	1493.04	II
	1555.	II
3	1653.08	II
5	1653.13	II
1	1653.21	II
	1681.66	II
	1755.33	II
	Air	
	2009.	II
	2039.	I
	2068.	II
	2131.	II
	2164.	II
	2173.4	I
	2183.	II
	2214.	II
	2222.	II
	2237.	II
h	2249.21	II
	2286.82	II
	2302.57	II
	2303.33	II
	2304.59	I
	2304.92	I
	2305.36	I
	2305.83	I
	2306.29	I
	2306.82	I
	2307.44	I
	2308.97	I
	2309.88	I
	2310.94	I
	2312.11	I
	2313.49	I
	2315.08	I
	2316.95	I
	2319.18	I
	2321.88	I
	2325.11	I
	2329.02	I
	2329.84	II
	2333.94	I
3	2336.88	II
5	2336.91	II
2	2337.00	II
	2340.15	I
	2348.22	I
	2358.93	I
	2373.54	I
	2381.54	II
	2383.20	II
1	2394.39	I
	2402.33	II
	2410.84	II
3	2425.43	I
	2429.81	II
	2460.2	I
10	2475.06	I
	2506.94	II
	2508.78	II
	2518.	I
	2539.49	II
24	2551.7	II
	2559	II
15	2562.31	I
	2605.08	II
	2640.	
2	2657.29	II
3	2657.30	II

Li I and II

Intensity	Wavelength	
	2674.46	II
0	2728.24	II
5	2728.29	II
2	2728.32	II
3	2730.47	II
1	2730.55	II
5	2741.20	I
	2766.99	II
	2790.31	II
	2801.	I
	2846.	I
	2868.	I
	2895.	I
2	2934.02	II
2	2934.07	II
5	2934.12	II
1	2934.25	II
	2968.	I
3	3029.12	II
3	3029.14	II
	3144.	I
3	3155.31	II
4	3155.33	II
1	3196.26	II
9	3196.33	II
4	3196.36	II
5	3199.33	II
2	3199.43	II
17	3232.66	I
	3249.87	II
	3306.28	II
	3393.	
	3488.	I
	3579.8	I
	3618.	I
	3662.	I
	3684.32	II
1	3714.00	II
5	3714.16	II
6 d	3714.27	II
8	3714.29	II
7 d	3714.40	II
10	3714.41	II
1	3714.51	II
0	3714.58	II
3	3718.7	I
6	3794.72	I
20	3915.30	I
20	3915.35	I
10	3985.48	I
10	3985.54	I
40	4132.56	I
40	4132.62	I
	4196.	I
20	4273.07	I
20	4273.13	I
5	4325.42	II
5	4325.47	II
1	4325.54	II
	4516.45	II
	4590.	
13	4602.83	I
13	4602.89	I
	4607.34	II
0	4671.51	II
6	4671.65	II
2	4671.70	II
3	4678.06	II
1	4678.29	II

Li I and II

Intensity	Wavelength	
	4760.	I
	4763.	II
	4788.36	II
	4843.0	II
4	4881.32	II
4	4881.39	II
1	4881.49	II
8	4971.66	I
8	4971.75	I
	5037.92	II
	5095.	
	5114.	
	5190.	
	5271.	I
	5315.	I
	5395.	I
	5440.	I
600 c	5483.55	II
600 c	5485.65	II
320	6103.54	I
320	6103.65	I
3600	6707.76	I
3600	6707.91	I
48	8126.23	I
48	8126.45	I
	8517.37	II
	9581.42	II
	10120.	II
	12232.	I
	12782.	I
	13566.	I
	17552.	I
	18697.	I
	19290.	I
	24467.	I
	40475.	I

Li III

Ref. 335 - J.O.S.

Vacuum

102.9	III
103.4	III
104.1	III
105.5	III
108.0	III
113.9	III
135.0	III
540.0	III
729.1	III

LUTETIUM (Lu)

Z = 71

Lu I and II

Ref. 1 - C.H.C.

Air

Intensity	Wavelength	
1700 h	2195.54	II
95	2276.94	II
190	2297.41	II
1300	2392.19	II
120	2399.14	II
80	2419.21	II
55	2430.26	II
130	2459.64	II
80	2469.27	II
21 h	2481.72	II
370	2536.95	II
40	2546.87	II
20	2549.44	I

Lu I and II

Intensity	Wavelength	
20	2549.72	I
35	2561.80	II
930	2571.23	II
1700	2578.79	II
80 h	2582.13	II
1800	2613.40	II
18000	2615.42	II
1800	2619.26	II
90	2657.05	
2700	2657.80	II
90 h	2677.25	I
570 h	2685.08	I
90 h	2685.54	I
4200	2701.71	II
90 h	2715.91	I
180 d	2719.09	I
480 h	2728.95	I
75 c	2738.17	II
3600	2754.17	II
750 h	2765.74	I
2700	2796.63	II
35	2821.23	II
270 c	2834.35	II
330 h	2845.13	I
3000	2847.51	II
570 h	2885.14	I
6300	2894.84	II
4500	2900.30	II
300	2903.05	I
9000	2911.39	II
270 h	2949.73	I
1200	2951.69	II
60	2955.78	II
4200	2963.32	II
2400	2969.82	II
1800	2989.27	I
3000	3020.54	II
120	3027.29	II
2100	3056.72	II
7500	3077.60	II
390	3080.11	I
5100 h	3081.47	I
3000	3118.43	I
2400	3171.36	I
100	3183.73	II
260	3191.80	II
1400	3198.12	II
4800	3254.31	II
3800	3278.97	I
7600	3281.74	I
6200	3312.11	I
7600	3359.56	I
6200	3376.50	I
950	3385.50	I
160 h	3391.55	I
1400	3396.82	I
4100	3397.07	II
4800	3472.48	II
8300 c	3507.39	II
1600	3508.42	I
4800	3554.43	II
4800	3567.84	I
340	3596.34	I
800	3623.99	II
680	3636.25	I
2600	3647.77	I
60	3684.32	I
60	3710.95	I
110	3756.70	I

Lu I and II		
Intensity	Wavelength	
110	3756.79	I
30 h	3786.18	I
150	3800.67	I
75 h	3829.07	I
2700	3841.18	I
75	3843.61	I
95	3853.29	I
40	3874.61	I
530	3876.65	II
29	3911.77	I
50	3918.86	I
35 h	3926.62	I
480	3968.46	I
50	3991.38	I
670	4054.45	I
75bl	4096.13	LuO
35 h	4107.44	I
95 h	4112.67	I
310	4122.49	I
3100	4124.73	I
150 c	4131.79	I
460	4154.08	I
24	4158.98	I
1600	4184.25	II
150	4277.50	I
250	4281.03	I
330 d	4295.97	I
	4296.09	I
150	4309.57	I
75	4332.72	I
29	4341.98	II
65 h	4420.96	I
190 c	4430.48	I
35	4438.79	I
190	4450.81	I
50 h	4471.55	I
60 h	4498.85	I
3300	4518.57	I
24 b	4560.95	LuO
24 b	4575.31	LuO
85 c	4605.39	I
95 h	4645.47	I
100 h	4648.21	I
95 h	4648.85	I
65 b	4654.03	LuO
1000	4658.02	I
85 h	4659.03	I
630bl	4661.75	LuO
310bl	4672.31	LuO
420bl	4684.16	LuO
270bl	4695.46	LuO
190bl	4708.00	LuO
30	4716.70	I
65 b	4720.86	LuO
65 h	4726.20	I
100bl	4735.00	LuO
75bl	4749.11	LuO
40bl	4764.22	LuO
150	4785.42	II
85	4815.05	I
50 c	4839.62	II
18	4865.36	II
460	4904.88	I
180	4942.34	I
800	4994.13	II
800	5001.14	I
55 h	5057.60	I
140	5134.05	I
2700	5135.09	I

Lu I and II		
Intensity	Wavelength	
130bl	5170.11	LuO
170	5196.61	I
90	5206.47	I
40	5304.40	I
80	5349.12	I
500	5402.57	I
140 c	5421.90	I
100	5437.88	I
35	5453.57	I
2100	5476.69	II
9	5664.89	II
14	5713.49	II
550	5736.55	I
55	5775.40	I
80	5800.59	I
40 h	5860.79	I
9	5866.30	I
690cw	5983.9	II
140	5997.13	I
1400	6004.52	I
35 h	6041.66	I
440	6055.03	I
11	6140.71	I
150	6159.94	II
160	6199.66	II
2100	6221.87	II
35	6228.14	II
80	6235.36	II
160	6242.34	II
16 h	6248.80	I
70 h	6345.35	I
18 h	6354.85	I
9	6365.79	I
16	6366.00	I
22	6441.14	I
11	6444.89	II
1100	6463.12	II
29	6477.67	I
55 c	6523.18	I
35cw	6611.28	II
	6611.58	II
	6611.80	II
	6611.95	II
	6612.04	II
11	6619.15	II
23 c	6677.14	I
9 h	6735.76	I
30 c	6793.77	I
11	6826.59	II
45	6917.31	I
8	6943.96	II
23	7031.24	I
14 c	7096.34	I
45	7125.84	II
9	7142.79	I
7	7143.10	I
8	7165.94	II
14ch	7237.98	I
5	7409.70	II
11 c	7441.52	I
8	7456.96	II
7ch	7640.08	I
7cw	7758.30	I
7 h	7815.9	I
9 c	8178.16	I
17	8382.08	I
35	8459.19	II
10 d	8478.50	I
29 c	8508.08	I

Lu I and II		
Intensity	Wavelength	
35 c	8610.98	I
Lu III		
Ref. 148 – J.R.		
Vacuum		
1	677.34	III
7	691.05	III
30	700.25	III
50	714.89	III
100	738.76	III
200	755.03	III
3	755.16	III
500	810.73	III
100	830.53	III
2000	832.28	III
10	972.66	III
2	991.26	III
100	996.44	III
400	1001.18	III
1	1022.40	III
100	1029.83	III
200	1030.33	III
100	1031.54	III
50	1056.53	III
20	1061.99	III
3	1092.84	III
200	1187.34	III
50	1228.7	III
200	1277.53	III
30	1283.41	III
100	1331.93	III
1000	1854.57	III
Air		
40	2050.72	III
1500	2065.35	III
1500 c	2070.56	III
100	2083.34	III
200	2099.44	III
1000	2236.14	III
2000	2236.22	III
500 c	2381.59	III
300	2563.51	III
4500 c	2603.35	III
200	2721.65	III
2000	2772.55	III
20	2781.16	III
10	2788.37	III
500	2800.90	III
20 p	2993.21	III
1000	3057.86	III
200	4251.44	III
300	4271.91	III
200	4490.00	III
400	4956.43	III
10	5046.12	III
150 c	5145.86	III
70	5419.42	III
60	5519.88	III
5	5526.80	III
5	5748.71	III
70	5786.46	III
80	5869.71	III
60	5889.76	III
300	6197.96	III
600	6198.13	III
100	7309.95	III
200	7310.25	III
50	7534.27	III
70 l	7936.45	III

Lu III		
Intensity	Wavelength	
3	8008.59	III
Lu IV		
Ref. 310 – J.R.		
Vacuum		
400	876.80	IV
100	902.06	IV
300	1015.18	IV
20	1136.17	IV
50	1189.27	IV
20 p	1194.59	IV
60	1213.08	IV
15	1220.74	IV
20	1223.75	IV
20	1240.07	IV
20	1248.10	IV
40	1266.27	IV
100	1272.42	IV
20	1273.02	IV
40	1274.77	IV
20	1276.54	IV
50	1289.38	IV
60	1310.08	IV
50	1323.02	IV
15	1331.04	IV
800	1333.79	IV
300	1334.94	IV
50	1338.20	IV
100	1339.49	IV
300	1342.58	IV
200	1351.68	IV
300	1353.74	IV
200	1355.85	IV
20	1359.67	IV
100	1363.24	IV
50	1363.37	IV
20	1367.34	IV
20	1373.54	IV
15	1375.36	IV
100	1376.02	IV
30	1379.56	IV
15	1383.18	IV
15	1389.85	IV
60	1390.07	IV
200	1390.30	IV
50	1390.69	IV
40	1392.38	IV
40	1397.18	IV
30	1401.32	IV
100	1401.46	IV
200	1406.64	IV
100	1407.00	IV
250	1407.04	IV
20	1420.32	IV
100	1421.59	IV
200	1429.08	IV
400	1429.38	IV
40	1430.80	IV
100	1440.62	IV
100	1448.14	IV
200	1452.33	IV
30	1462.65	IV
100	1483.79	IV
200	1493.24	IV
400	1511.26	IV
200	1521.06	IV
100	1522.21	IV
100	1537.77	IV
30	1549.35	IV

Lu IV		
Intensity	Wavelength	
20	1551.59	IV
20	1562.06	IV
30	1592.55	IV
15	1594.92	IV
100 c	1607.72	IV
50 c	1631.65	IV
20	1684.50	IV
60 c	1693.67	IV
400 c	1721.42	IV
100	1725.14	IV
100 c	1735.79	IV
100	1736.78	IV
100	1741.74	IV
50 c	1743.84	IV
40 c	1752.60	IV
200	1759.61	IV
300	1772.08	IV
600	1772.57	IV
200	1782.45	IV
100	1797.52	IV
20 c	1901.63	IV
100	1983.92	IV
20	1990.52	IV
40	1996.18	IV
	Air	
100	2003.18	IV
100	2020.94	IV
20	2071.10	IV
100	2081.09	IV
400 c	2085.70	IV
600 c	2086.47	IV
400 c	2092.16	IV
100	2103.63	IV
1000 c	2104.41	IV
200 c	2107.85	IV
1000 c	2108.31	IV
100 c	2127.43	IV

Lu V		
Ref. 401 - J.R.		
Vacuum		
40	555.44	V
100	563.72	V
50	601.54	V
60	614.23	V
40	628.79	V
50 p	637.44	V
40	637.53	V
50	663.29	V
60	850.06	V
100	861.92	V
70	866.93	V
40	870.84	V
50	875.89	V
50	876.45	V
100	880.32	V
40	884.21	V
70	886.16	V
50	886.32	V
50	886.44	V
100	891.81	V
60	895.01	V
40	895.15	V
40	898.42	V
100	914.72	V
40	918.26	V
50	920.92	V
40	921.32	V
60	921.90	V

Lu V		
Intensity	Wavelength	
40	922.73	V
80	925.79	V
50	927.22	V
40	947.80	V
50 w	1420.02	V
50	1432.50	V
100	1432.77	V
200	1441.76	V
40	1443.64	V
100	1448.14	V
40	1449.32	V
100	1450.36	V
100	1450.69	V
100	1452.64	V
200	1453.35	V
100	1454.38	V
100	1455.21	V
100	1460.11	V
40 c	1467.81	V
200	1468.99	V
50	1469.45	V
100	1471.20	V
400	1472.12	V
200	1473.71	V
40	1475.77	V
200	1485.58	V
50	1709.02	V
40	1728.90	V
50 c	1775.92	V
40 c	1777.68	V
40 c	1784.71	V
100 c	1786.25	V
60 c	1787.58	V
60 c	1793.85	V
60	1809.73	V
60	1814.24	V

MAGNESIUM (Mg)

Z = 12

Mg I and II		
Refs. 49,83,103,217,269,		
315,335 - J.O.S.		
Vacuum		
	184.05	II
	184.31	II
	184.68	II
	184.81	II
	185.26	II
	185.59	II
	185.98	II
	186.47	II
	186.84	II
	187.19	II
	187.38	II
	188.54	II
	188.91	II
	189.01	II
	189.23	II
	189.37	II
	191.30	II
	191.56	II
	191.65	II
	192.40	II
	192.55	II
	192.84	II
	193.09	II
	193.31	II

Mg I and II		
Intensity	Wavelength	
	193.40	II
	193.64	II
	197.76	II
	199.31	II
	200.29	I
	202.00	II
	202.27	II
	202.51	II
	202.94	II
	203.15	I
	203.42	II
	203.53	II
	204.22	I
	209.09	II
	209.43	II
	209.84	I
	213.53	I
	215.12	I
	215.31	I
	215.45	I
	215.66	I
	215.79	I
	216.22	I
	216.36	I
	216.68	I
	217.21	I
	217.37	I
	218.19	I
	218.34	I
	218.42	I
	218.74	I
	219.04	I
	219.28	I
	220.03	I
	220.33	I
	222.03	I
	222.67	I
	223.45	I
	223.74	I
	225.18	I
	225.54	I
	226.26	I
	247.14	II
	248.47	II
	884.70	II
	884.72	II
	907.38	II
	907.41	II
8	946.70	II
9	946.77	II
14	1025.96	II
12	1026.11	II
25	1239.94	II
20	1240.40	II
6	1248.51	II
8	1249.93	II
8	1271.24	II
9	1271.94	II
8	1272.72	II
11	1273.43	II
11	1306.71	II
12	1307.88	II
12	1308.28	II
14	1309.44	II
14	1365.45	II
	1365.54	II
15	1367.26	II
15	1367.70	II
18	1369.42	II

Mg I and II		
Intensity	Wavelength	
20	1476.00	II
25	1478.01	II
20	1480.89	II
30	1482.90	II
	1625.22	I
	1625.50	I
	1625.81	I
	1626.16	I
	1626.36	I
	1626.56	I
	1626.79	I
	1627.02	I
	1627.27	I
	1627.53	I
	1627.82	I
	1628.12	I
	1628.46	I
	1628.80	I
	1629.21	I
	1629.59	I
	1630.52	I
	1631.62	I
	1632.93	I
	1634.52	I
	1636.48	I
	1638.90	I
	1641.97	I
1	1645.93	I
1	1651.16	I
2	1658.31	I
5	1668.43	I
10	1683.41	I
15	1707.06	I
40	1734.84	II
50	1737.62	II
20	1747.80	I
40	1750.65	II
50	1753.46	II
30	1827.93	I
	Air	
9	2025.82	I
3	2329.58	II
6	2449.57	II
1	2557.23	I
1	2560.94	I
1	2562.26	I
1	2564.94	I
1	2570.91	I
1	2572.25	I
2	2574.94	I
1	2577.89	I
1	2580.59	I
1	2584.22	I
2	2585.56	I
3	2588.28	I
1	2591.89	I
1	2593.23	I
2	2595.97	I
2	2602.50	I
4	2603.85	I
5	2606.62	I
1	2613.36	I
2	2614.73	I
3	2617.51	I
3	2628.66	I
6	2630.05	I
8	2632.87	I
2	2644.80	I
3	2646.21	I

Mg I and II

Intensity	Wavelength	
4	2649.06	I
8	2660.76	II
8	2660.82	II
6	2668.12	I
8	2669.55	I
10	2672.46	I
3	2693.72	I
5	2695.18	I
6	2698.14	I
8	2731.99	I
10	2733.49	I
12	2736.53	I
5	2765.22	I
7	2768.34	I
38	2776.69	I
32	2778.27	I
90	2779.83	I
8	2781.29	I
32	2781.42	I
36	2782.97	I
13	2790.79	II
1000	2795.53	II
16	2798.06	II
600	2802.70	II
12	2846.75	I
14	2848.42	I
16	2851.65	I
6000	2852.13	I
3	2915.45	I
10	2936.74	I
12	2938.47	I
2	2942.00	I
3	2809.76	I
2	2811.11	I
1	2811.78	I
12	2846.72	I
14	2848.34	I
16	2851.66	I
2	2902.92	I
4	2906.36	I
3	2915.45	I
2	2928.75	II
3	2936.54	II
10	2936.74	I
12	2938.47	I
13	2942.00	I
1	2967.87	II
1	2971.70	II
20	3091.08	I
22	3092.99	I
14	3096.90	I
9	3104.71	II
8	3104.81	II
6	3168.98	II
6	3172.71	II
7	3175.78	II
2	3197.62	I
17	3329.93	I
6	3332.15	I
9	3336.68	I
7	3535.04	II
8	3538.86	II
7	3549.52	II
8	3553.37	II
140	3829.30	I
300	3832.30	I
500	3838.29	I
8	3848.24	II
1	3848.91	I

Mg I and II

Intensity	Wavelength	
7	3850.40	II
2	3853.96	I
1	3854.96	I
2	3858.86	I
3	3878.31	I
2	3891.91	I
2	3893.30	I
3	3895.57	I
4	3903.86	I
6	3938.40	I
1	3984.21	I
8	3986.75	I
2	4054.69	I
10	4057.50	I
3	4075.06	I
2	4081.83	I
4	4165.10	I
15	4167.27	I
20	4351.91	I
6	4354.53	I
6	4380.38	I
9	4384.64	II
10	4390.59	II
8	4428.00	II
9	4433.99	II
5	4436.49	II
4	4436.60	II
14	4481.16	II
13	4481.33	II
6	4534.29	II
28	4571.10	I
3	4621.30	I
7	4702.99	I
10	4730.03	I
6	4739.59	II
5	4739.71	II
7	4851.10	II
75	5167.33	I
220	5172.68	I
400	5183.61	I
8	5264.21	II
7	5264.37	II
1	5345.98	I
9	5401.54	II
2	5509.60	I
6	5528.41	I
30	5711.09	I
5	5785.31	I
4	5785.56	I
7	5916.43	II
6	5918.16	II
10	6318.72	I
9	6319.24	I
7	6319.49	I
10	6346.74	II
9	6346.96	II
11	6545.97	II
5	6620.44.	II
6	6620.57	II
2	6630.83	I
7	6781.45	II
8	6787.85	II
7	6812.86	II
8	6819.27	II
4	6894.90	I
6	6965.40	I
8	7060.41	I
10	7193.17	I
10	7291.06	I

Mg I and II

Intensity	Wavelength	
5	7387.00	I
12	7387.69	I
4	7580.76	II
20	7657.60	I
19	7659.15	I
17	7659.90	I
8	7690.16	I
15	7691.55	I
1	7722.61	I
1	7746.34	I
1	7759.30	I
5	7786.50	II
4	7790.98	II
3	7811.14	I
12	7877.05	II
2	7881.67	I
13	7896.37	II
7	7930.81	I
3	8047.73	I
5	8049.85	I
7	8054.23	I
10	8098.72	I
9	8115.22	II
8	8120.43	II
1	8154.64	I
2	8159.13	I
10	8209.84	I
20	8213.03	I
10	8213.99	II
7	8222.92	II
7	8233.19	II
11	8234.64	II
7	8303.31	I
9	8305.60	I
10	8310.26	I
15	8346.12	I
2	8466.48	I
5	8468.84	I
7	8473.69	I
10	8710.18	I
12	8712.69	I
13	8717.83	I
10	8734.99	II
17	8736.02	I
11	8745.66	II
14	8806.76	I
10	8824.32	II
11	8835.08	II
20	8923.57	I
7	8989.03	I
9	8991.69	I
10	8997.16	I
14	9218.25	II
13	9244.27	II
12	9246.50	I
30	9255.78	I
10	9327.54	II
10	9340.54	II
25	9414.96	I
17	9429.81	I
19	9432.76	I
20	9438.78	I
8	9502.45	I
7	9503.11	I
5	9503.43	I
12	9631.89	II
11	9632.43	II
15	9953.20	I
15	9983.20	I

Mg I and II

Intensity	Wavelength	
17	9986.47	I
18	9993.21	I
14	10092.16	II
5	10391.76	II
6	10392.23	II
35	10811.08	I
11	10914.23	II
7	10915.27	II
10	10951.78	II
25	10953.32	I
27	10957.30	I
28	10965.45	I
15	11032.10	I
14	11033.66	I
5	11255.93	II
4	11256.35	II
45	11828.18	I
30	12083.66	I
28	14877.62	I
35	15024.99	I
30	15040.24	I
25	15047.70	I
6	15740.71	I
8	15748.99	I
10	15765.84	I
30	17108.66	I
5	26392.90	I

Mg III

Refs. 4,83,177 – J.O.S.

Intensity	Vacuum Wavelength	
	106.30	III
	106.92	III
	108.08	III
	110.16	III
	114.32	III
	126.50	III
15	170.80	III
15	171.39	III
15	182.24	III
12	182.97	III
20	186.51	III
20	187.20	III
10	188.53	III
100	231.73	III
80	234.26	III
10	1274.83	III
11 h	1280.70	III
12	1391.27	III
15	1393.39	III
10	1431.14	III
16	1572.71	III
12	1586.24	III
13	1687.09	III
13	1697.28	III
10	1722.04	III
22	1738.84	III
12	1747.56	III
18	1748.93	III
15	1772.98	III
20	1783.25	III
14	1794.58	III
15	1800.66	III
13	1858.19	III
12	1879.49	III
10	1908.50	III
12	1923.90	III
13	1930.67	III
11	1937.84	III

Mg III

Intensity	Wavelength (Air)	
15	2039.55	III
15	2055.49	III
25	2064.90	III
15	2085.90	III
20	2091.96	III
13	2097.93	III
15	2112.77	III
16	2134.06	III
20	2177.70	III
20	2395.15	III
15	2467.75	III
10	2490.54	III
10	2529.19	III
12	3299.05	III
13	3306.39	III
12	3335.90	III
11	3342.58	III
12	3361.41	III
10	3381.24	III
11	3382.90	III
11	3387.37	III
10	3706.74	III
10	4916.00	III
10	5839.82	III
15	6256.75	III

Mg IV

Refs. 7,128,129 – J.O.S.

Intensity	Wavelength (Vacuum)	
40	118.16	IV
80 p	118.81	IV
70	123.59	IV
240	124.65	IV
300	129.86	IV
300	132.81	IV
400	146.95	IV
300	147.41	IV
300	147.54	IV
350	180.07	IV
400	180.62	IV
400	180.80	IV
350	181.34	IV
4000	320.99	IV
3000	323.31	IV
40	800.41	IV
150	857.29	IV
30	866.74	IV
50	919.03	IV
30	929.78	IV
40	1008.76	IV
30	1026.41	IV
250	1037.41	IV
80	1044.37	IV
60	1055.76	IV
300	1210.99	IV
300	1342.19	IV
800	1346.57	IV
300	1346.68	IV
600	1352.05	IV
900	1384.46	IV
500	1385.77	IV
800	1387.53	IV
300	1404.68	IV
1000	1409.36	IV
500	1437.53	IV
1000	1437.64	IV
300	1447.42	IV
300	1459.54	IV

Mg IV

Intensity	Wavelength (Air)	
400	1459.62	IV
400	1481.51	IV
350	1490.45	IV
300	1495.50	IV
300	1607.11	IV
500	1683.02	IV
400	1698.81	IV
300	1844.17	IV
12 p	2518.40	IV
4	2534.79	IV

Mg V

Ref. 128 – J.O.S.

Intensity	Wavelength (Vacuum)	
5	251.58	V
35	276.58	V
10	312.30	V
20	351.09	V
18	352.20	V
30	353.09	V
15	353.30	V
18	354.22	V
20	355.33	V

MANGANESE (Mn)

Z = 25

Mn I and II

Refs. 1,126 – C.H.C.

Intensity	Wavelength (Vacuum)	
20	1726.47	II
30	1732.70	II
50	1733.55	II
40	1734.49	II
30	1737.93	II
20	1740.16	II
20	1742.00	II
30	1853.27	II
20	1857.92	II
50	1902.95	II
20	1907.84	II
30	1911.41	II
20 d	1914.68	II
100	1915.10	II
20	1918.64	II
30	1919.64	II
80	1921.25	II
20	1923.07	II
20	1923.34	II
30	1925.52	II
50	1926.59	II
30	1931.40	II
20	1945.15	II
20	1947.93	II
20	1950.14	II
30	1953.23	II
20 d	1954.81	II
30	1959.25	II
20	1969.24	II
30	1994.23	II
9700	1996.06	I
14000	1999.51	I
18000	2003.85 (Air)	I
50	2037.31	II
40	2037.64	II
40	2039.97	II
30	2076.21	II

Mn I and II

Intensity	Wavelength (Air)	
1500	2092.16	I
20	2097.46	II
20	2102.50	II
1700	2109.58	I
30	2113.96	II
290	2208.81	I
540	2213.85	I
770	2221.84	I
20	2373.36	II
20	2427.38	II
50	2427.72	II
30	2427.94	II
30	2437.37	II
20	2437.84	II
30	2452.49	II
50	2499.00	II
30	2507.60	II
20	2516.60	II
30	2516.74	II
20	2521.66	II
20	2530.72	II
20	2531.80	II
50	2532.78	II
75	2533.06	I
50	2533.33	II
30	2534.10	II
80	2534.22	II
100	2535.66	II
30	2535.98	II
100	2537.92	II
50	2541.11	II
80	2542.92	II
50	2543.45	II
100	2548.75	II
50	2551.85	II
30	2553.27	II
75	2556.57	II
30	2556.89	II
50	2557.54	II
95	2558.59	II
30	2559.41	II
150	2563.65	II
30	2565.22	II
580	2572.76	I
480	2575.51	I
12000	2576.10	II
550	2584.31	I
30	2588.97	II
45	2589.71	II
250	2592.94	I
6200	2593.73	II
250	2595.76	I
95	2598.90	II
40	2602.14	I
30	2602.72	II
45	2603.72	II
4300	2605.69	II
190	2610.20	II
500	2618.14	II
140	2622.90	I
150	2624.04	I
40	2624.80	II
200	2625.58	II
95	2626.64	I
30	2630.26	I
60	2630.57	I
190	2632.35	II
130	2638.17	II
80	2639.84	II

Mn I and II

Intensity	Wavelength (Air)	
27	2650.99	II
60	2655.91	II
30	2666.77	II
45	2667.00	I
30	2667.03	II
110	2672.59	II
55	2673.37	II
55	2674.43	II
30	2676.33	I
45	2680.34	II
30	2680.68	II
30	2681.25	II
40	2681.72	I
45	2683.02	I
23	2683.75	I
55	2684.55	II
55	2685.94	II
110	2688.25	II
85	2692.66	I
27	2693.19	II
55	2695.36	II
27	2698.97	II
85	2701.00	II
50	2701.17	II
160	2701.70	II
100	2703.98	II
130	2705.74	II
80	2707.53	II
110	2708.45	II
45	2709.96	II
80	2710.33	II
110	2711.58	II
30	2716.80	II
30	2717.53	II
30	2719.01	II
50	2719.74	II
30	2722.10	II
30	2724.46	II
55	2728.61	II
30	2738.86	I
45 h	2760.93	I
30	2771.44	I
30 h	2776.23	I
30	2780.00	I
55	2789.20	I
60	2790.36	I
60	2791.08	I
6200	2794.82	I
5100	2798.27	I
220	2799.84	I
3700	2801.06	I
70	2804.10	I
60	2806.14	I
55	2808.02	I
110	2809.11	I
60	2812.84	I
70	2813.47	I
60	2815.02	II
30	2816.33	II
85	2817.97	I
40	2818.77	I
55	2821.45	I
55	2822.55	I
80	2830.79	I
27	2836.31	I
60	2870.08	II
30	2872.94	II
80	2879.49	II
40	2882.90	I

Mn I and II

Intensity	Wavelength	
70	2886.68	II
160	2889.58	II
55	2892.39	II
50	2898.70	II
80	2900.16	II
40	2907.22	I
140 h	2914.60	I
190 h	2925.57	I
27	2928.68	I
1100	2933.06	II
27	2934.02	I
1500	2939.30	II
250 h	2940.39	I
	2940.48	I
60	2941.04	I
1900	2949.20	II
40	3007.66	I
40	3011.16	I
40	3011.38	I
40	3014.67	I
60	3016.45	I
30	3019.92	II
70	3022.75	I
55	3031.06	II
30	3035.35	II
95	3040.60	I
27	3042.73	I
85	3043.36	I
330	3044.57	I
120	3045.59	I
200	3047.04	I
40	3048.86	I
30	3050.65	II
250	3054.36	I
140	3062.12	I
170	3066.02	I
170	3070.27	I
160	3073.13	I
90	3079.63	I
50	3081.33	I
23	3082.05	I
40	3097.06	I
40	3110.68	I
60 h	3148.18	I
90 h	3161.04	I
140 h	3178.50	I
220	3212.88	I
65	3216.95	I
1000	3228.09	I
300	3230.72	I
850	3236.78	I
330	3243.78	I
650	3248.52	I
100	3251.14	I
310	3252.95	I
65	3254.04	I
310	3256.14	I
220	3258.41	I
180	3260.23	I
180	3264.71	I
65	3296.88	I
65	3298.22	I
65	3320.69	I
70	3330.67	I
200	3330.78	II
100	3336.39	II
30	3365.02	II
30	3400.12	II
50	3438.97	II

Mn I and II

Intensity	Wavelength	
720	3441.99	II
50	3460.03	II
360	3460.33	II
360 h	3474.04	II
	3474.13	II
290	3482.91	II
180	3488.68	II
140	3495.84	II
50	3496.81	II
100	3497.54	II
360	3531.85	I
	3532.00	I
1100	3532.12	I
1300	3547.80	I
1100	3548.03	I
390	3548.20	I
2200	3569.49	I
720	3569.80	I
	3570.04	I
1400	3577.88	I
720	3586.54	I
290	3595.12	I
420	3607.54	I
420	3608.49	I
360	3610.30	I
290	3619.28	I
220	3623.79	I
140	3629.74	I
100	3660.40	I
70	3670.52	I
70	3676.96	I
50	3682.09	I
280	3693.67	I
180	3696.57	I
70	3701.73	I
210	3706.08	I
130	3718.93	I
55	3728.89	I
130	3731.93	I
260	3790.22	I
55	3799.26	I
110	3800.55	I
55	3801.91	I
3200	3806.72	I
700	3809.59	I
55	3810.69	I
90	3816.75	I
2100	3823.51	I
390	3823.89	I
200	3829.68	I
480	3833.86	I
1300	3834.36	I
350	3839.78	I
670	3841.08	I
350	3843.98	I
65	3918.32	I
120	3926.47	I
65	3952.84	I
55	3975.89	I
65	3977.08	I
130	3982.58	I
150	3985.24	I
190	3986.83	I
150	3987.10	I
1500	4018.10	I
150	4026.44	I
27000	4030.76	I
19000	4033.07	I
11000	4034.49	I

Mn I and II

Intensity	Wavelength	
1500	4035.73	I
55	4038.73	I
5600	4041.36	I
210 d	4045.13	I
	4045.21	I
1100	4048.76	I
80	4049.00	I
55	4051.73	I
65	4052.47	I
150	4055.21	I
1900	4055.54	I
210	4057.95	I
1100	4058.93	I
150	4059.39	I
730	4061.74	I
730	4063.53	I
80	4065.08	I
80	4068.00	I
290	4070.28	I
730	4079.24	I
730	4079.42	I
1100	4082.94	I
1100	4083.63	I
65	4089.94	I
55	4105.36	I
200	4110.90	I
150	4131.12	I
120	4135.04	I
80	4141.06	I
55	4147.53	I
80	4148.80	I
150	4176.60	I
120	4189.99	I
65	4201.76	I
65	4211.75	I
370	4235.14	I
510	4235.29	I
190	4239.72	I
290	4257.66	I
290	4265.92	I
270	4281.10	I
65	4284.08	I
65	4312.55	I
50	4323.63	II
45	4374.95	I
45	4381.70	I
55	4411.88	I
350	4414.88	I
55	4419.78	I
210	4436.35	I
800	4451.59	I
160	4453.00	I
130	4455.01	I
160	4455.32	I
110	4455.82	I
55	4457.04	I
210	4457.55	I
270	4458.26	I
55	4460.38	I
150	4461.08	I
510	4462.02	I
290	4464.68	I
200	4470.14	I
130	4472.79	I
40	4479.40	I
170	4490.08	I
240	4498.90	I
240	4502.22	I
80	4605.36	I

Mn I and II

Intensity	Wavelength	
80	4626.54	I
35	4671.69	I
50	4701.16	I
160	4709.72	I
180	4727.48	I
130	4739.11	I
1000	4754.04	I
180	4761.53	I
750	4762.38	I
300	4765.86	I
500	4766.43	I
940	4783.42	I
1000	4823.52	I
25	4844.32	I
35	4965.88	I
19	5004.91	I
30	5074.79	I
60	5117.94	I
50	5150.89	I
50	5196.59	I
85	5255.32	I
160	5341.06	I
19	5349.88	I
95	5377.63	I
95	5394.67	I
50	5399.49	I
95	5407.42	I
35	5413.69	I
85	5420.36	I
35	5432.55	I
12	5457.47	I
60	5470.64	I
40	5481.40	I
30	5505.87	I
50	5516.77	I
40	5537.76	I
21	5551.98	I
8	5567.76	I
7	5573.01	I
8	5573.68	I
7	5738.29	I
7	5780.19	I
7	5816.84	I
140	6013.50	I
200	6016.64	I
290	6021.80	I
7	6384.67	I
17	6440.97	I
24	6491.71	I
14 h	6942.52	I
12	6989.96	I
14	7069.84	I
12	7184.25	I
10	7247.82	I
24 h	7283.82	I
35 h	7302.89	I
50	7326.51	I
12	7680.20	I
10	7712.42	I
10 h	7764.72	I
10 h	8670.92	I
12 h	8672.06	I
10 h	8673.97	I
12 h	8701.05	I
17 h	8703.76	I
30 h	8740.93	I

Mn III
Ref. 385 - C.H.C.

Mn III

Intensity	Wavelength Vacuum	
20	892.39	III
20	1108.16	III
30	1183.30	III
25 w	1183.86	III
30	1198.49	III
30	1219.80	III
100	1228.97	III
500	1283.58	III
400	1287.59	III
300	1291.62	III
1000	1360.72	III
800	1365.20	III
400	1369.43	III
300	1371.65	III
300	1596.95	III
500 h	1609.17	III
1000	1614.14	III
2000	1620.60	III
300	1623.91	III
400	1629.12	III
500	1633.80	III
250	1647.46	III
400	1653.57	III
400	1804.06	III
300	1806.47	III
300	1811.02	III
400	1877.62	III
300	1885.21	III
500	1941.28	III
250 w	1942.89	III
800	1943.21	III
500	1952.36	III
1000	1952.52	III
300	1956.61	III
250	1962.04	III
500	1978.95	III
400	1982.76	III
400	1989.59	III
	Air	
300	2022.19	III
1000 w	2027.83	III
500 w	2028.14	III
300	2044.57	III
400	2048.93	III
500	2049.68	III
300	2056.80	III
500	2066.38	III
1000	2069.02	III
900	2077.38	III
300	2078.13	III
800	2084.23	III
600	2090.05	III
300	2090.25	III
300	2094.14	III
500	2094.78	III
500	2097.93	III
500	2099.97	III
300	2123.25	III
1000	2169.78	III
700	2174.15	III
900	2176.87	III
800	2181.86	III
800 w	2184.87	III
600	2185.13	III
400	2211.95	III
600	2212.42	III
800	2215.21	III
900	2220.55	III

Mn III

Intensity	Wavelength	
1000	2227.42	III
100	3287.49	III
100	3540.52	III
150	3601.72	III
100	3616.00	III
100	4246.17	III
200	5079.20	III
150	5100.03	III
100	5117.03	III
100	5252.23	III
100	5365.59	III
150	5454.07	III
200	5474.68	III
100	5671.12	III
200	5946.65	III
100 s	6213.11	III
200	6231.21	III
100	6238.64	III
100	6273.71	III

Mn IV

Ref. 433 - C.H.C.

Vacuum		
60	579.79	IV
60	581.44	IV
60	581.65	IV
60	585.21	IV
90	1242.25	IV
90	1244.50	IV
85	1247.73	IV
95	1251.93	IV
95	1257.28	IV
90	1264.41	IV
70	1603.60	IV
70	1611.10	IV
75	1653.83	IV
70	1656.39	IV
70	1659.25	IV
75	1664.73	IV
80 b	1667.00	IV
70	1670.08	IV
75	1691.68	IV
75	1693.15	IV
80	1698.30	IV
75	1698.70	IV
70	1699.06	IV
75	1707.43	IV
65	1718.67	IV
75 b	1720.52	IV
75	1720.74	IV
75	1721.41	IV
65	1722.94	IV
75	1724.83	IV
85 b	1742.10	IV
85	1751.59	IV
75	1759.82	IV
70	1762.17	IV
75	1762.94	IV
85 d	1766.27	IV
75	1767.09	IV
65	1772.11	IV
75	1773.51	IV
75	1782.21	IV
75	1786.02	IV
75	1787.04	IV
75	1787.38	IV
75	1788.64	IV
75	1790.44	IV
80	1795.65	IV

Mn IV

Intensity	Wavelength	
80	1795.79	IV
60	1907.03	IV
75	1910.25	IV
65	1997.54	IV

Mn V

Ref. 405 - C.H.C.

Vacuum		
300	404.36	V
380	406.02	V
300	406.40	V
600	410.30	V
600	410.60	V
480	410.98	V
400	411.32	V
460	412.74	V
460	413.75	V
600	415.62	V
650	415.98	V
350	419.80	V
600	428.59	V
500	429.05	V
400	433.54	V
600	435.67	V
350	436.16	V
500	436.18	V
450	438.74	V
350	439.35	V
1000	441.72	V
850	442.49	V
400	467.32	V
300	474.82	V

MERCURY (Hg) (198)

Z = 80

Hg I and II (198)

Refs. 43,50,69,145,229,242 - R.W.S.

Vacuum		
80	1250.564	I
8	1259.242	I
100	1268.825	I
5	1307.751	I
20	1402.619	I
10	1435.503	I
1000	1849.492	I
	Air	
60	2262.210	II
20	2302.065	I
20	2345.440	I
100	2378.325	I
20	2380.004	I
40	2399.349	I
20	2399.729	I
20	2446.900	I
15	2464.064	I
40	2481.999	I
30	2482.713	I
40	2483.821	I
90	2534.769	I
15000	2536.506	I
25	2563.861	I
25	2576.290	I
250	2652.043	I
400	2653.683	I
100	2655.130	I
50	2698.831	I
80	2752.783	I

Hg I and II (198)

Intensity	Wavelength	
20	2759.710	I
40	2803.471	I
30	2804.438	I
750	2847.675	II
50	2856.939	I
150	2893.598	I
150	2916.227	II
60	2925.413	I
1200	2967.283	I
300	3021.500	I
120	3023.476	I
30	3025.608	I
50	3027.490	I
400	3125.670	I
320	3131.551	I
320	3131.842	I
80	3341.481	I
2800	3650.157	I
300	3654.839	I
80	3662.883	I
240	3663.281	I
30	3701.432	I
35	3704.170	I
30	3801.660	I
20	3901.867	I
60	3906.372	I
200	3983.839	II
1800	4046.572	I
150	4077.838	I
40	4108.057	I
250	4339.224	I
400	4347.496	I
4000	4358.337	I
80	4916.068	I
1100	5460.753	I
160	5675.922	I
240	5769.598	I
280	5790.663	I
20	6072.713	I
30	6234.402	I
160	6716.429	I
250	6907.461	I
240	11287.407	I

MERCURY(Hg) (Natural)

Z = 80

Hg I and II (Nat.)

Refs. 34,45,90,117,133,189, 235,304,327,328 - R.W.S.

Vacuum		
400	893.08	II
300	915.83	II
150	923.39	II
200	940.80	II
100	962.74	II
50	969.13	II
800	1099.26	II
80	1250.58	I
8	1259.24	I
100	1268.82	I
5	1307.75	I
300	1307.93	II
400	1321.71	II
400	1331.74	II
80	1350.07	II
200	1361.27	II
20	1402.62	I

Hg I and II (Nat.)

Intensity	Wavelength	
200	1414.43	II
10	1435.51	I
15	1619.46	II
120	1623.95	II
20	1628.25	II
150	1649.94	II
50	1653.64	II
200	1672.41	II
100	1702.73	II
100	1707.40	II
120	1727.18	II
250	1732.14	II
20	1775.68	I
40	1783.70	II
30	1796.22	II
200	1796.90	II
60	1798.74	II
30	1803.89	II
40	1808.29	II
400	1820.34	II
5	1832.74	I
1000	1849.50	I
160	1869.23	II
300	1870.55	II
200	1875.54	II
20	1900.28	II
30	1927.60	II
300	1942.27	II
100	1972.94	II
200	1973.89	II
150	1987.98	II
	Air	
90	2026.97	II
90	2052.93	II
70	2148.00	II
5	2247.55	I
60	2262.23	II
20	2302.06	I
15	2323.20	I
5	2340.57	I
20	2345.43	I
20	2352.48	I
100	2378.32	I
20	2380.00	I
40	2399.38	I
20	2399.73	I
10	2400.49	I
60	2407.35	II
50	2414.13	II
5	2441.06	I
20	2446.90	I
15	2464.06	I
40	2482.00	I
30	2482.72	I
40	2483.82	I
90	2534.77	I
15000	2536.52	I
25	2563.86	I
25	2576.29	I
5	2578.91	I
15	2625.19	I
5	2639.78	I
250	2652.04	I
400	2653.69	I
100	2655.13	I
5	2674.91	I
50	2698.83	I
50	2699.38	I
80	2705.36	II

Hg I and II (Nat.)

Intensity	Wavelength	
80	2752.78	I
20	2759.71	I
40	2803.46	I
30	2804.43	I
2	2805.34	I
2	2806.77	I
150	2814.93	II
750	2847.68	II
50	2856.94	I
150	2893.60	I
150	2916.27	II
60	2925.41	I
150	2935.94	II
400	2947.08	II
1200	2967.28	I
300	3021.50	I
120	3023.47	I
30	3025.61	I
50	3027.49	I
400	3125.67	I
320	3131.55	I
320	3131.84	I
400	3208.20	II
400	3264.06	II
80	3341.48	I
100	3385.25	II
400	3451.69	II
200	3549.42	II
2800	3650.15	I
300	3654.84	I
80	3662.88	I
240	3663.28	I
30	3701.44	I
35	3704.17	I
30	3801.66	I
100	3806.38	II
20	3901.87	I
60	3906.37	I
100	3918.92	II
200	3983.96	II
1800	4046.56	I
150	4077.83	I
40	4108.05	I
250	4339.22	I
400	4347.49	I
4000	4358.33	I
100	4398.62	II
90	4660.28	II
80	4855.72	II
5	4883.00	I
5	4889.91	I
80	4916.07	I
5	4970.37	I
5	4980.64	I
20	5102.70	I
40	5120.64	I
100	5128.45	II
20	5137.94	I
20	5290.74	I
5	5316.78	I
60	5354.05	I
30	5384.63	I
1100	5460.74	I
30	5549.63	I
160	5675.86	I
240	5769.60	I
100	5789.66	I
280	5790.66	I
140	5803.78	I

Hg I and II (Nat.)

Intensity	Wavelength	
60	5859.25	I
60	5871.73	II
20	5871.98	I
20	6072.72	I
1000	6149.50	II
30	6234.40	I
80	6521.13	II
160	6716.43	I
250	6907.52	I
250	7081.90	I
200	7091.86	I
40	7346.37	II
100	7485.87	II
20	7728.82	I
100	7944.66	II
2000	10139.75	I
240	11287.40	I
120	13209.95	I
140	13426.57	I
60	13468.38	I
80	13505.58	I
500	13570.21	I
450	13673.51	I
200	13950.55	I
500	15295.82	I
100	16881.48	I
400	16920.16	I
300	16942.00	I
500	17072.79	I
400	17109.93	I
20	17116.75	I
20	17198.67	I
20	17213.20	I
70	17329.41	I
30	17436.18	I
50	18130.38	I
40	19700.17	I
	22493.28	I
250	23253.07	I
	32148.06	I
	36303.03	I

Hg III
Ref. 343 – C.H.C.
Vacuum

3	621.44	III
2	679.68	III
2	878.59	III
1	886.48	III
1	988.89	III
2	1009.29	III
5	1068.03	III
2	1161.95	III
9	1681.40	III
15	1759.75	III
1	1894.77	III
	Air	
7	2314.15	III
4	2380.55	III
8	2431.65	III
5	2480.56	III
7	2484.50	III
2	2612.92	III
4	2617.97	III
3	2670.49	III
70	2724.43	III
6	2769.22	III
3	2844.76	III
15	3090.05	III

Hg III

Intensity	Wavelength	
5	3283.02	III
12	3312.28	III
8	3389.01	III
5	3450.77	III
3	3500.35	III
4	3538.88	III
5	3557.24	III
15	3803.51	III
70	4122.07	III
10	4140.34	III
100	4216.74	III
15	4470.58	III
12	4552.84	III
50	4797.01	III
10	4869.85	III
80	4973.57	III
30	5210.82	III
6	5695.71	III
25	6220.35	III
35	6418.98	III
40	6501.38	III
10	6584.26	III
6	6610.12	III
30	6709.29	III
12	7517.46	III
7	7808.10	III
25	7946.75	III
50	7984.51	III
5	8151.64	III

MOLYBDENUM (Mo)

Z = 42

Mo I and II
Ref. 1 – C.H.C.
Air

19000	2015.11	II
40000	2020.30	II
21000	2038.44	II
17000	2045.98	II
4800	2081.68	II
2400	2089.52	II
2200	2092.50	II
4000	2093.11	II
2700	2100.84	II
1500	2104.29	II
1400	2108.02	II
400	2269.69	II
160	2304.25	II
160	2306.97	II
130	2325.94	I
240	2330.46	I
110	2332.12	II
190	2340.47	I
190	2341.59	II
80	2352.61	I
80	2355.22	I
80	2355.42	II
70	2364.37	I
50	2366.09	II
140	2372.27	I
100	2380.41	I
150	2383.52	I
110	2389.20	II
140	2403.61	II
80	2404.66	II
140	2405.86	I
40	2408.39	I

Mo I and II			Mo I and II			Mo I and II			Mo I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
40	2412.84	II	330	2636.67	II	1700	2816.15	II	70	2971.91	II
120	2413.01	II	250	2638.30	I	220	2817.44	II	250	2972.61	II
70	2415.33	I	720	2638.76	II	50	2822.03	II	80	2975.40	II
80	2417.96	II	410	2640.99	I	240	2826.54	I	180	2978.28	I
65	2419.01	II	600	2644.35	II	80	2827.74	II	120	2981.52	I
80	2420.18	II	370	2646.49	II	40	2831.44	II	110	2987.92	I
70	2424.00	II	640	2649.46	I	30	2832.07	II	160	2988.68	I
65	2430.43	I	480	2653.35	II	80	2834.39	II	190	2989.80	I
65	2435.96	II	560 h	2655.03	I	80	2835.33	II	95	2992.84	II
65	2440.28	II	290	2658.11	I	160	2842.15	II	50	2993.52	II
40	2461.81	II	640	2660.58	II	24	2843.73	II	190	3002.21	I
50	2466.68	II	110	2665.10	I	220	2844.39	I	40	3004.46	II
50	2466.97	II	55	2671.83	II	1700	2848.23	II	130	3013.39	I
50	2468.78	II	720	2672.84	II	160	2849.38	I	140 h	3013.76	I
30	2470.04	II	250	2673.27	II	370	2853.23	II	250	3025.00	I
150 h	2471.97	I	1000	2679.85	I	50	2856.00	II	95	3027.77	II
70	2477.57	II	95	2681.36	II	24	2863.20	II	100	3036.31	I
70 h	2481.81	I	640	2683.23	II	370	2863.81	II	300	3041.70	I
65	2482.57	II	880	2684.14	II	160	2864.31	I	150	3046.80	I
40	2484.75	II	560	2687.99	II	140	2864.66	I	210	3047.31	I
40 h	2485.31	I	30	2692.61	II	40	2865.62	II	210	3055.32	I
24	2496.24	II	55	2695.22	II	220	2866.69	II	100	3060.78	II
85	2498.28	II	30	2696.83	II	40	2868.11	II	160	3061.59	I
40	2500.44	II	55	2699.41	II	40	2868.32	II	800	3064.28	I
65	2502.84	II	140	2701.03	I	1700	2871.51	II	250	3065.04	II
50	2511.80	II	480	2701.42	II	85	2872.88	II	100	3068.00	I
65	2515.08	II	30	2701.87	II	220	2879.05	II	250	3070.90	I
70	2527.14	II	30	2704.93	II	65	2888.15	II	800	3074.37	I
50	2530.34	II	40	2710.19	II	95	2891.28	II	85	3077.66	II
70	2532.31	II	30	2711.49	II	1300	2890.99	II	150	3079.88	I
440	2538.46	II	50	2712.35	II	190	2892.81	II	210	3080.41	I
50	2539.44	II	190	2713.51	II	950	2894.45	II	800	3085.62	I
110 h	2540.45	I	290	2717.35	II	140	2897.63	II	270	3087.62	II
330	2542.67	II	110	2724.41	I	70	2900.80	II	100	3089.12	I
40	2543.61	II	180	2725.15	I	290	2903.07	II	100	3089.71	I
330	2548.22	I	85	2726.97	II	160	2905.27	I	190	3092.07	II
110 h	2550.85	I	140	2729.68	II	80	2907.12	II	560	3094.66	I
65	2555.42	II	80	2730.20	II	600	2909.12	II	110	3099.93	I
40	2556.75	II	330	2732.88	II	1100	2911.92	II	110	3100.88	I
80	2558.88	II	250	2733.39	I	55	2913.81	II	560	3101.34	I
65	2562.08	II	160	2736.96	II	120	2918.83	II	1400	3112.12	I
85	2564.34	II	80 h	2737.88	II	1300	2923.39	II	290	3122.00	II
40	2566.26	II	50	2738.60	II	140	2924.32	II	14000	3132.59	I
250	2567.05	I	40	2741.32	II	65	2927.54	II	110	3138.72	II
20	2571.45	II	55	2741.62	II	50	2930.06	II	220	3147.35	I
320	2572.34	I	240	2743.07	I	1100	2930.50	II	220	3152.82	II
50	2574.42	II	290	2746.30	II	55	2930.77	II	55	3155.64	II
40	2576.56	II	320	2751.47	I	800	2934.30	II	6000	3158.16	I
40	2578.36	II	110	2756.07	II	65	2935.20	II	120	3164.53	I
250	2582.16	I	65 d	2758.63	II	120	2937.66	I	8700	3170.35	I
30	2585.95	II	20	2760.53	II	40	2938.30	II	95	3172.03	II
65	2588.78	II	190	2761.53	I	95	2940.10	II	160	3172.74	II
40	2591.77	II	220	2763.62	II	110	2941.22	II	370	3183.03	I
250	2593.70	II	110	2766.26	I	140	2944.21	I	120	3184.57	I
100	2595.40	I	240	2769.76	II	150	2944.82	II	370	3185.10	I
40	2597.38	II	160	2773.78	II	140	2945.66	I	180	3185.71	I
250	2602.80	II	190	2774.39	II		2945.95	II	120 d	3187.59	II
40	2605.08	II	1700	2775.40	II	190	2946.01	I	7600	3193.97	I
40	2605.93	II	130	2777.74	I	140	2946.42	I	290	3195.96	I
250	2607.37	I	65	2777.86	II	140	2946.69	II	120	3198.85	I
190	2611.20	I	880	2780.04	II	95	2947.28	II	40	3201.50	II
290	2613.08	I	400	2784.99	II	95	2955.84	II	330	3205.22	I
130	2615.39	I	180	2787.83	I	240	2956.06	II	880	3205.88	I
400	2616.78	I	40	2791.54	II	70	2956.90	II	3000	3208.83	I
70	2619.34	II	240 d	2797.93	I	95	2960.24	II	240	3210.97	I
140	2621.07	I	220	2801.47	I	140	2962.89	I	560	3215.07	I
320	2627.55	I	400	2807.76	II	250	2963.79	II	350	3221.74	I
160	2628.74	I	28	2812.58	II	50	2964.96	II	880	3228.22	I
440	2629.85	I	24	2814.67	II	210	2965.27	II	600	3229.79	I

Mo I and II			Mo I and II			Mo I and II			Mo I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
1100	3233.14	I	200	3623.23	I	990	4434.95	I	100	5167.76	I
950	3237.08	I	1400	3624.46	I	200	4442.20	I	160 d	5171.08	I
65	3240.71	II	330	3626.18	I	340	4449.74	I		5171.25	I
950	3256.21	I	28	3635.14	II	480	4457.36	I	230 h	5172.94	I
300	3262.63	I	1000	3635.43	I	630	4474.56	I	160 h	5174.18	I
480	3264.40	I	400	3657.35	I	230	4491.28	I	40	5191.44	I
800	3270.90	I	540	3664.81	I	120	4504.90	I	110	5200.17	I
240	3285.02	I	290	3666.72	I	140	4512.15	I	50	5200.74	I
320	3285.36	I	590	3672.82	I	230	4517.13	I	26	5210.44	I
1100	3289.02	I	1300	3680.60	I	230	4524.34	I	50	5211.86	I
950	3290.82	I	45	3684.22	II	120	4529.40	I	80	5219.40	I
190	3292.31	II	65	3688.31	II	400	4536.80	I	65	5231.06	I
320	3305.56	I	240	3690.59	I	110	4558.11	I	26	5232.36	I
320	3307.12	I	180	3692.64	II	210	4576.50	I	100	5234.26	I
100	3313.62	II	1400	3694.94	I	170	4595.16	I	460 h	5238.20	I
190	3320.90	II	220	3702.03	I	360	4609.88	I	230 h	5240.88	I
640	3323.95	I	220	3715.65	I	100	4621.38	I	110 h	5242.81	I
360	3325.67	I	500	3727.69	I	460	4626.47	I	100	5245.51	I
360	3327.30	I	330 d	3732.71	I	100	4627.48	I	150	5259.04	I
240	3340.17	I	240	3742.28	I	220	4662.76	I	16	5260.17	I
1300	3344.75	I	80	3744.37	II	130	4671.90	I	65	5261.14	I
95	3346.40	II	360	3770.45	I	130	4688.22	I	20	5268.95	I
320	3347.02	I	220	3779.77	I	640	4707.26	I	35	5271.80	I
1600	3358.12	I	360	3781.59	I	150	4708.22	I	35	5276.28	I
250	3361.37	I	250	3797.30	I	220	4717.92	I	65	5279.65	I
950	3363.78	I	29000	3798.25	I	100	4729.14	I	210	5280.86	I
950	3379.97	I	290	3801.84	I	700	4731.44	I	20	5283.84	I
320	3382.48	I	520	3826.70	I	100	4750.39	I	55	5292.08	I
1900	3384.62	I	940	3828.87	I	770	4760.19	I	35	5293.46	I
130	3395.36	II	1700	3833.75	I	150	4776.34	I	55	5295.47	I
640	3404.34	I	380	3847.25	I	100	4796.52	I	20	5306.26	I
1300	3405.94	I	29000	3864.11	I	410	4819.25	I	55	5313.89	I
240	3418.52	I	580	3869.08	I	410	4830.51	I	35	5315.04	I
250	3420.04	I	580	3886.82	I	360	4868.00	I	20	5319.89	I
250	3422.31	I	380	3901.77	I	110	4950.62	I	20	5324.47	I
380	3434.79	I	19000	3902.96	I	150	4957.54	I	35	5327.06	I
320	3435.45	I	65	3941.48	II	210	4979.12	I	20	5352.35	I
640	3437.22	I	230	3943.04	I	110	4999.91	I	80	5354.88	I
250	3438.87	I	270	4056.01	I	20	5010.81	I	35	5355.51	I
250	3441.44	I	1400	4062.08	I	180	5014.60	I	65	5356.48	I
250	3443.26	I	2300	4069.88	I	26	5016.78	I	560hl	5360.56	I
130	3446.08	II	1300	4081.44	I	20	5019.85	I	110hl	5364.28	I
3200	3447.12	I	940	4084.38	I	80	5029.00	I	35hl	5367.11	I
640	3449.07	I	250	4102.15	I	65	5030.78	I	35	5372.40	I
300	3451.75	I	730	4107.47	I	23	5038.91	I	26	5388.69	I
250	3452.60	I	630	4120.10	I	26	5046.52	I	65	5394.52	I
950	3456.39	I	2900	4143.55	I	100	5047.71	I	35	5397.38	I
640	3460.78	I	230	4148.94	I	50	5055.00	I	50	5400.47	I
320	3466.83	I	250	4155.28	I	35	5058.07	I	35	5405.79	I
250	3467.85	I	200	4157.40	I	200	5059.88	I	35	5406.39	I
320	3469.22	I	200	4178.27	I	35	5062.52	I	40	5417.38	I
240	3485.93	I	480	4185.82	I	29	5064.64	I	23	5426.89	I
800	3504.41	I	2500	4188.32	I	35	5079.87	I	55	5435.68	I
240	3505.32	I	250	4194.56	I	100	5080.02	I	65	5437.75	I
560	3508.12	I	1500	4232.59	I	35	5081.26	I	40	5450.51	I
480	3521.41	I	270	4269.28	I	40	5090.97	I	35	5456.46	I
240	3524.98	I	890	4276.91	I	35	5091.34	I	26	5460.53	I
640	3537.28	I	1200	4277.24	I	35	5092.16	I	23	5465.57	I
320	3542.17	I	1400	4288.64	I	40	5095.89	I	35	5475.90	I
520	3558.10	I	680	4292.13	I	100	5096.65	I	35	5490.28	I
400	3563.14	I	890	4293.21	I	130	5097.52	I	20	5492.17	I
300	3566.05	I	360	4293.88	I	35	5098.03	I	26 h	5493.80	I
240	3570.65	I	840	4326.14	I	130	5109.71	I	26	5498.49	I
320	3573.88	I	250	4326.74	I	80	5114.97	I	50	5501.54	I
1400	3581.89	I	230	4350.34	I	35	5116.97	I	23	5501.87	I
200	3590.74	I	230	4369.04	I	29	5123.83	I	26 h	5503.54	I
210	3598.88	I	1900	4381.64	I	150	5145.38	I	7800	5506.49	I
270	3602.94	I	2500	4411.57	I	110	5147.39	I	23	5520.04	I
210	3608.37	I	210	4423.62	I	80	5163.19	I	26	5520.64	I

Mo I and II

Intensity	Wavelength	
40	5526.52	I
40	5526.97	I
5200	5533.05	I
40	5539.41	I
50	5543.12	I
40	5544.49	I
55	5556.28	I
26	5556.72	I
20	5564.05	I
40	5568.62	I
26	5569.48	I
2500	5570.45	I
35	5575.19	I
20	5591.58	I
40	5602.76	I
23	5608.62	I
23	5609.23	I
100	5610.93	I
23	5613.07	I
20	5618.45	I
23	5619.38	I
330	5632.47	I
50	5634.86	I
230	5650.13	I
23	5673.63	I
55	5674.47	I
40	5677.89	I
35	5682.89	I
460	5689.14	I
23	5699.28	I
80	5705.72	I
23	5711.80	I
210	5722.74	I
23	5728.77	I
26 d	5729.45	I
	5729.59	I
620	5751.40	I
23	5774.55	I
40	5779.36	I
23 h	5783.33	I
520	5791.85	I
23 h	5795.77	I
26	5800.46	I
35	5802.67	I
23	5825.20	I
23	5835.59	I
20	5839.99	I
20 h	5848.86	I
55 h	5849.73	I
50 h	5851.52	I
520	5858.27	I
20	5861.38	I
50	5869.33	I
26	5876.59	I
820	5888.33	I
23	5892.29	I
50 h	5893.38	I
20	5898.78	I
	5898.82	I
40	5901.47	I
40 h	5926.36	I
160 h	5928.88	I
40	5988.17	I
35	6025.49	I
16	6027.27	I
1300	6030.66	I
20	6047.83	I
20	6054.81	I
20	6079.58	I

Mo I and II

Intensity	Wavelength	
10	6081.27	I
40	6101.87	I
10	6130.63	I
10	6197.66	I
20	6217.89	I
10	6264.27	I
16	6265.88	I
15	6290.74	I
13	6301.75	I
11	6323.54	I
40	6357.22	I
16	6389.11	I
11	6391.12	I
35	6401.07	I
26	6409.11	I
10	6412.39	I
100	6424.37	I
20	6446.34	I
20	6471.20	I
20	6473.99	I
10	6493.13	I
23	6519.84	I
15 h	6611.20	I
230	6619.13	I
10	6624.57	I
50	6650.38	I
13	6659.68	I
18	6690.47	I
110	6733.98	I
21	6746.08	I
50	6746.27	I
35	6753.97	I
13	6763.50	I
10 h	6799.88	I
10	6802.62	I
10	6812.03	I
13	6825.63	I
18 d	6828.87	I
	6829.05	I
40	6838.88	I
16	6848.92	I
21	6886.28	I
16	6892.36	I
10	6898.01	I
10	6898.98	I
13	6908.20	I
35	6914.01	I
13	6934.10	I
10	6947.39	I
10	6960.64	I
16	6978.71	I
26	6988.94	I
12	6999.13	I
16	7001.60	I
22	7037.98	I
22	7060.21	I
13	7063.34	I
13	7081.22	I
110	7109.87	I
27	7134.08	I
150	7242.50	I
40	7245.85	I
22	7267.62	I
17	7300.19	I
13	7348.49	I
13	7361.65	I
10 h	7364.41	I
40	7391.36	I
10	7434.10	I

Mo I and II

Intensity	Wavelength	
13	7447.34	I
13 h	7452.85	I
140	7485.74	I
13	7504.47	I
11	7572.64	I
11 h	7595.16	I
11	7601.84	I
17 h	7656.76	I
13	7679.49	I
27	7720.77	I
17	7829.65	I
15	7854.45	I
11	7923.15	I
15	7986.60	I
22 h	8245.06	I
40 h	8328.44	I
45 h	8389.32	I
45 h	8483.39	I

Mo III
Ref. 420 - C.H.C.
Vacuum

50	1166.07	III
100	1169.33	III
50	1173.67	III
50	1209.60	III
50	1225.46	III
50	1230.34	III
50	1234.63	III
30	1236.10	III
100	1254.93	III
100	1262.21	III
100	1263.74	III
100	1274.37	III
50	1274.94	III
100	1276.40	III
200	1277.40	III
200	1277.58	III
100	1278.06	III
200	1278.40	III
150	1281.90	III
150	1283.60	III
100	1258.52	III
100	1286.42	III
50	1288.07	III
50	1288.25	III
100	1290.49	III
100	1299.82	III
50	1305.58	III
50	1437.37	III
50	1452.38	III
50	1534.86	III
50	1751.22	III
50	1760.57	III
50	1807.60	III
100	1854.73	III
	Air	
75	2165.19	III
75	2170.57	III
50	2172.46	III
75	2179.37	III
100	2184.37	III
100	2211.02	III
50	2223.19	III
100	2253.18	III
150	2269.71	III
50	2275.47	III
50	2275.64	III
200	2294.97	III

Mo III

Intensity	Wavelength	
80	2304.26	III
50	2326.75	III
150	2330.93	III
100	2359.76	III
80	2386.96	III
50	2403.61	III
70	2412.71	III
50	2422.18	III
200	2506.19	III
90	2597.13	III
50	2756.06	III
100	2807.74	III
125	2947.32	III
75	2983.94	III
80	3254.70	III
200	3271.69	III

Mo IV
Ref. 383 - C.H.C.
Vacuum

10	857.75	IV
10	859.72	IV
25	865.24	IV
20	865.53	IV
20	863.63	IV
50	867.92	IV
10	878.43	IV
100	884.19	IV
10	884.82	IV
60	886.05	IV
50	891.74	IV
40	894.80	IV
15	895.41	IV
20	1819.50	IV
30	1821.59	IV
30	1850.69	IV
20	1877.88	IV
80	1926.26	IV
100	1929.24	IV
20	1949.44	IV
80	1971.06	IV
20	1991.41	IV
	Air	
70	2010.92	IV
20	2023.78	IV
25	2055.64	IV
50	2060.38	IV
15	2091.89	IV
10	2113.78	IV
5	2140.33	IV

NEODYMIUM (Nd)

Z = 60

Nd I and II
Ref. 1 - C.H.C.
Air

75	2702.46	
75	2704.54	
75	2764.98	I
60	2785.79	I
50	2863.95	
50	2921.26	
55	2962.88	II
65	2963.58	II
80	2993.20	II
40	2994.73	
95	3007.97	II
95	3014.19	II

Nd I and II			Nd I and II			Nd I and II			Nd I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
95	3018.35	II	250	3331.57	II	370	3755.60	II	1300	3889.93	II
80	3026.47	II	290	3334.48	II	510	3757.82	II	1300	3890.58	II
50	3038.98	II	290	3339.07	II	930	3758.95	II	1300	3890.94	II
50	3043.29		320	3353.59	II	300	3759.79	II	580	3891.51	II
50	3051.11	II	200	3355.93	II	930	3763.47	II	470	3892.06	II
80	3052.15	II	270	3364.96	II	300	3766.59	II	810	3894.63	II
140	3056.71	II	290	3393.63	II	510	3769.65	II	270	3896.13	II
130	3069.73	II	120 h	3484.88	I	1400	3775.50	II	440	3897.63	II
65 d	3071.43	II	200	3527.53	II	250	3776.34	II	2000	3900.21	II
	3071.50	II	290	3543.35	II	710	3779.47	II	1300	3901.84	II
160	3075.38	II	200	3555.77	II	580	3780.40	II	1700	3905.89	II
95	3079.38	II	410	3560.75	II	510	3781.32	II	200	3907.70	II
95	3080.94	II	340	3568.87	II	300	3783.78	II	510	3907.84	II
95	3092.73		470	3587.51	II	2400	3784.25	II	2000	3911.16	II
240	3092.92	II	300	3592.59	II	270	3784.73	II	850	3912.23	II
140	3098.48	II	340	3598.02	II	340	3791.50	II	340	3913.69	II
55	3099.52	II	300	3600.91	II	340	3795.45	II	440	3915.13	II
130	3105.43	II	320	3609.79	II	240	3799.55	II	610	3915.95	II
95	3106.18	II	370	3615.82	II	370	3801.12	II	340	3917.65	II
65	3108.01	II	300	3618.96	II	200	3801.38	II	220	3919.92	II
260	3115.18	II	300	3631.02	II	340	3802.30	II	1100	3920.96	II
190	3116.15	II	340	3634.30	II	1200	3803.47	II	510	3927.10	II
50	3119.75	II	240	3637.00	II	200	3804.10	II	200	3929.26	II
160	3123.06	II	240	3637.23	II	2500	3805.36	II	610	3934.82	II
190	3124.58	II	240	3640.24	II	340	3805.55	II	410	3936.11	II
290	3133.60	II	240	3645.78	II	470	3807.23	II	510	3938.86	II
220	3134.90	II	340	3648.20	II	540	3808.77	II	2000	3941.51	II
100	3137.24	II	240	3649.46		440	3809.06	II	2000	3951.16	II
170	3141.46	II	240	3650.42	II	580	3810.49	II	810	3952.20	II
170	3142.44	II	410	3653.15	II	240	3811.06	II	320	3952.87	II
100	3144.55	II	240	3654.16		270	3811.77	II	320	3953.52	II
100	3144.82	II	470	3662.26	II	200	3812.53	II	240	3957.45	II
100	3148.51	II	540	3665.18	II	710	3814.73	II	590	3958.00	II
100	3149.29	II	540	3672.36	II	240	3819.70	II	510	3962.21	II
100	3149.51	II	580	3673.54	II	410	3822.47	II	1400	3963.12	II
100	3162.62	II	240	3678.18	II	1200	3826.42	II	270	3963.90	II
100	3175.99	II	1200	3685.80	II	240	3828.00	II	1100	3973.30	II
50	3181.54	II	440	3687.30	II	540	3828.85	II	740	3973.69	II
50	3188.73	II	410	3689.69	II	440	3829.16	II	740	3976.85	II
50	3200.62	II	300	3694.81	II	510	3830.47	II	740	3979.49	II
150	3203.47	II	410	3697.56	II	740	3836.54	II	320	3982.36	II
85	3211.00	II	240	3702.84		340	3837.91	II	470	3986.25	II
100	3217.12	II	240	3704.95	II	1700	3838.98	II	1400	3990.10	II
50	3222.62	I	200	3712.81		340	3839.51	II	1000	3991.74	II
50	3228.04	II	470	3713.70	II	410 d	3841.82	II	1100	3994.68	II
60	3234.62		370	3714.20	II		3841.88	II	410	4000.50	II
40	3237.91	II	640 d	3714.73	II	1700 d	3848.24	II	540	4004.02	II
100	3254.08	II	250	3715.04	II		3848.31	II	410	4007.43	II
50	3256.91	II	200	3715.39	II	1500	3848.52	II	3700	4012.25	II
220	3259.24	II	470	3715.68	II	470	3850.22	II	540	4012.70	II
100	3260.66	II	410	3718.54	II	2400 d	3851.66	II	370	4018.81	II
220	3265.12	II	410	3721.35	II		3851.74	II	1000	4020.87	II
50	3265.38	II	220	3722.42	II	340	3858.55	II	1000	4021.34	II
170	3267.25	II	780	3723.50	II	270	3860.94	II	1000	4021.78	II
100	3273.18	II	410	3724.87	II	300	3862.52	II	1200	4023.00	II
320	3275.22	II	250	3726.90	II	3700 d	3863.33	II	340	4024.78	II
50	3281.49	II	710	3728.13	II		3863.40	II	410	4030.47	II
50	3282.78	II	470	3730.58	II	240	3866.52	II	1200	4031.82	II
290	3285.10	II	270	3732.78	II	220	3866.81	II	270	4038.12	II
100	3286.62	II	1000 d	3735.54	II	850	3869.07	II	3000	4040.80	II
50	3289.52			3735.60	II	240	3875.74	II	200	4041.06	II
100	3290.65	II	440	3737.10	II	470	3875.87	II	410	4043.59	II
70	3293.84	II	1000	3738.06	II	1100	3878.58	II	410	4048.81	II
70	3294.68	II	270	3741.42	II	1000	3879.55	II	850	4051.15	II
70	3298.61		200	3749.85	II	780	3880.38	II	850	4059.96	II
300	3300.16	II	320	3750.31	II	1200	3880.78	II	4700	4061.09	II
200	3312.75	II	580	3752.49	II	200	3881.59		1100	4069.28	II
200	3325.90	II	370	3752.67	II	540	3887.87	II	710	4075.12	II
410	3328.28	II	250	3754.83	II	370 h	3889.66	II	470	4075.28	II

Nd I and II			Nd I and II			Nd I and II			Nd I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
240	4077.62	II	340	4541.27	II	340	5123.79	II	23	5767.33	I
470	4080.23	II	340	4542.61	II	680	5130.60	II	45	5776.12	I
240	4085.82	II	100	4556.14	II	170	5132.33	II	45	5784.96	I
270	4096.13	II	170	4559.67	I	170	5165.14	II	45	5788.22	I
220	4098.18	II	340	4563.22	II	130	5181.17	II	45	5800.09	I
200	4106.59	II	200	4578.89	II	120	5182.60	II	160	5804.02	II
1400	4109.08	II	200	4579.32	II	500	5191.45	II	80	5811.57	II
2500	4109.46	II	100	4586.62	I	630	5192.62	II	45	5813.89	I
510	4110.48	II	200	4597.02	II	330	5200.12	II	27	5820.37	I
300 h	4113.83	II	100	4603.82	I	310	5212.37	II	70	5825.87	II
410	4123.88	II	100	4609.87	I	150	5213.23	I	30	5826.74	I
470	4133.36	II	300	4621.94	I	130	5225.05	II	80	5842.39	II
510	4135.33	II	100	4627.98	I	130	5228.43	II	30	5844.66	I
3000	4156.08	II	510	4634.24	I	450	5234.20	II	23	5845.95	I
510	4156.26	II	340	4641.10	I	250	5239.79	II	55	5858.91	I
340	4160.57	II	250	4645.77	II	720	5249.59	II	35	5867.08	I
410	4168.00	II	200	4646.40	I	200	5250.82	II	30	5868.90	I
810	4175.61	II	300	4649.67	I	360	5255.51	II	27	5871.04	I
2400	4177.32	II	200	4654.73	I	120	5269.48	II	30	5883.29	I
200	4178.64	II	130	4670.56	II	590	5273.43	II	23	5886.24	I
640	4179.59	II	170	4680.74	II	150	5276.88	II	30	5887.91	I
250	4184.98	II	310	4683.45	I	110	5291.67	I	27	5921.22	I
470	4205.60	II	110	4684.04	I	680	5293.17	II	27	5955.87	I
470	4211.29	II	110	4690.35	I	160	5302.28	II	30	5994.76	I
290	4220.25	II	190	4696.44	I	110	5306.47	II	27	5996.47	I
440	4227.73	II	130	4703.57	II	220	5311.46	II	45	6007.67	I
1300	4232.38	II	470	4706.54	II	500	5319.82	II	35	6031.27	II
250	4234.19	II	140	4706.96	I	180	5356.98	II	27	6033.29	I
290 h	4235.24	II	190	4709.71	II	290	5361.47	II	45	6034.24	II
290	4239.84	II	190	4715.59	II	150	5371.94	II	55	6066.03	I
2000	4247.38	II	240	4719.02	I	110	5385.90	II	27	6071.70	I
850	4252.44	II	190	4724.35	II	160	5431.53	II	30	6073.97	I
290	4254.29		140	4731.77	I	110	5451.12	II	23 d	6133.47	II
410	4261.84	II	120	4779.46	I	170	5485.70	II	27	6149.28	I
340	4266.71	II	170	4789.41	II	35	5501.47	I	27	6155.06	I
240	4270.56	II	120	4797.15	II	45	5525.72	I	35	6157.83	II
340	4272.79	II	240	4811.34	II	90	5533.82	I	23	6166.67	II
340	4275.09	II	140	4820.34	II	55	5535.27	II	35	6170.49	II
470	4282.44	II	350	4825.48	II	55	5543.24	I	45	6178.59	I
240	4282.57	II	130	4832.28	II	55	5548.47	II	27	6183.91	II
710	4284.52	II	110	4849.06	II	55	5561.17	I	27	6208.24	I
270	4297.80	II	280	4859.02	II	27	5575.50	I	45	6223.39	I
5400	4303.58	II	190	4866.74	I	27	5576.70	I	27	6226.50	I
340	4304.45	II	350	4883.81	I	27	5577.70	I	23	6238.50	II
200	4307.78	II	140	4889.10	II	27	5587.61	I	35	6244.08	I
470	4314.52	II	220	4890.70	II	240	5594.43	II	23	6257.49	I
1100	4325.76	II	240	4891.07	I	55	5601.43	I	27	6258.73	II
510	4327.93	II	280	4896.93	I	45	5601.92	I	23	6277.29	II
540	4338.70	II	120	4901.53	I	220	5620.54	I	27	6285.79	I
680	4351.29	II	210	4901.84	I	65	5635.76	I	23	6292.84	II
850	4358.17	II	110	4902.03	II	45	5639.54	I	23	6297.07	I
240	4366.38	II	190	4913.41	I	35	5653.57	I	55	6310.49	I
340	4368.64	II	170	4914.37	II	70	5668.87	II	27	6341.51	II
470 d	4374.93	II	330	4920.68	II	65	5669.77	I	23	6382.07	II
	4375.04	II	470	4924.53	I	140 d	5675.97	I	65	6385.20	II
710	4385.66	II	260	4944.83	I	55	5676.33	I	35	6485.69	I
250	4390.66	II	290	4954.78	I	220	5688.53	II	45	6630.14	I
540	4400.83	II	290	4959.13	II	23	5689.51	I	35	6637.96	II
510	4411.06	II	150	4961.39	II	30	5701.57	I	45	6650.57	II
580	4446.39	II	250	4989.94	II	130	5702.24	II	30	6655.67	I
1400	4451.57	II	150	5033.52	II	80	5706.21	II	25	6737.79	II
200	4451.99	II	110	5063.73	II	160	5708.28	II	40	6740.11	II
300	4456.40	II	360	5076.59	II	80	5718.12	II	25	6742.54	I
740	4462.99	II	150 h	5089.84	II	65	5726.83	II	30	6790.37	II
410	4501.82	II	360	5092.80	II	100	5729.29	I	30	6804.00	II
200	4506.59	II	180	5102.39	II	23	5734.55		25	6846.72	II
170	4513.34	II	150 d	5105.21	II	70	5740.86	II	40	6900.43	II
250	4516.36	II		5105.35	I	55	5749.19	I	24	6941.39	II
120	4527.25	I	360	5107.59	II	27	5749.66	I	17 h	7010.80	II

Nd I and II		
Intensity	Wavelength	
8	7018.85	II
17	7020.92	II
17	7024.58	II
10	7033.21	
35	7037.30	II
7	7052.14	II
7	7054.74	II
7	7061.47	II
40	7066.89	II
8	7082.93	II
12 h	7089.71	II
12 h	7092.09	
12 h	7092.74	II
12 h	7092.94	
17 h	7093.98	I
20 h	7095.42	I
29	7129.35	II
12 h	7142.04	II
10	7143.72	
8	7151.03	II
6	7153.09	I
6 h	7185.01	
10	7189.09	II
24	7189.42	II
20	7192.01	II
10	7199.00	II
8 h	7227.01	I
15	7236.54	II
7 h	7261.64	II
9	7285.29	II
9	7288.56	II
6	7291.38	II
7	7298.72	II
12	7316.81	II
7 h	7321.43	I
7	7323.12	II
6	7334.54	I
6	7357.10	I
6	7374.04	II
7	7381.79	II
9	7401.31	I
10	7406.62	II
6	7411.20	II
10	7418.18	II
9	7427.41	II
9	7448.71	II
5	7481.28	II
12	7511.16	II
17	7513.73	II
7 h	7514.44	II
7	7516.02	II
9	7526.45	II
12	7528.99	II
10	7538.26	II
5	7540.97	II
7	7547.00	II
5	7577.54	II
7	7587.65	II
6	7590.75	II
6	7603.73	II
5	7605.92	II
5	7614.72	I
9	7639.79	II
8	7646.00	II
6	7663.52	II
12	7696.56	II
6	7718.20	II
4	7743.90	II
4	7748.92	II

Nd I and II		
Intensity	Wavelength	
10	7750.95	II
6	7773.06	II
7	7792.22	II
6	7796.40	II
8	7797.32	II
5	7798.32	II
10	7808.47	II
7	7818.83	II
5	7825.20	II
12	7863.04	II
5 h	7872.03	I
7	7886.60	II
4 h	7896.50	II
9	7900.40	II
5 h	7906.03	I
12	7917.01	II
10	7925.03	II
5	7947.93	II
10	7949.68	II
5 h	7955.38	II
12	7958.95	I
12	7965.73	II
15	7982.09	II
12	7982.68	II
12	8000.76	II
9	8007.70	I
4 h	8020.07	
8	8026.35	
10	8043.24	I
8	8051.33	II
5	8064.00	II
10	8099.17	I
10	8120.93	II
12	8122.07	II
12	8141.75	II
12	8143.27	II
7 h	8164.97	I
8	8172.56	II
9	8179.83	II
9	8182.41	II
4	8185.58	II
7 h	8205.38	II
10	8231.52	II
4	8248.76	II
5 h	8249.68	II
4 h	8262.80	II
7 h	8266.72	II
4	8272.79	II
4 h	8302.74	II
10	8307.72	II
6	8324.50	II
4	8332.01	II
12	8346.36	II
4	8375.16	II
4	8375.33	II
4	8394.71	II
7	8400.85	II
5 h	8456.87	II
4	8530.53	II
5	8582.03	II
5	8591.53	II
7	8594.87	II
8 c	8643.43	II
5	8667.07	II
5	8677.48	
6	8691.29	II
6	8695.07	II
6	8712.82	II
6	8715.03	I

Nd I and II		
Intensity	Wavelength	
17	8839.10	II

NEON (Ne)

Z = 10

Ne I and II

Refs. 56,58,118,150,230

- S.P.D.

Vacuum

90	352.956	I
60	354.962	I
90	361.433	II
60	362.455	II
150	405.854	II
120	407.138	II
200	445.040	II
300	446.256	II
250	446.590	II
180	447.815	II
150	454.654	II
200	455.274	II
10	456.275	II
120	456.348	II
90	456.896	II
1000	460.728	II
500	462.391	II
35	587.213	I
35	589.179	I
35	589.911	I
70	591.830	I
100	595.920	I
75	598.706	I
35	598.891	I
70	600.036	I
170	602.726	I
170	615.628	I
170	618.672	I
120	619.102	I
200	626.823	I
200	629.739	I
1000	735.896	I
400	743.720	I
60	993.88	I
70	1068.65	I
90	1131.72	I
100	1131.85	II
90	1229.83	I
90	1418.38	I
90	1428.58	I
90	1436.09	I
120	1681.68	II
180	1688.36	II
100	1888.11	II
100	1889.71	II
200	1907.49	II
500	1916.08	II
300	1930.03	II
200	1938.83	II
100 c	1945.46	II

Air

80	2007.01	II
80	2025.56	II
150	2085.47	II
180	2096.11	II
120	2096.25	II
80 p	2562.12	II
90 w	2567.12	II
80	2623.11	II

Ne I and II		
Intensity	Wavelength	
80	2629.89	II
90 w	2636.07	II
80	2638.29	II
80	2644.10	II
80	2762.92	II
90	2792.02	II
80	2794.22	II
100	2809.48	II
80	2906.59	II
80	2906.82	II
90	2910.06	II
90	2910.41	II
80	2911.14	II
80	2915.12	II
80	2925.62	II
80 w	2932.10	II
80	2940.65	II
90	2946.04	II
150	2955.72	II
150	2963.24	II
150	2967.18	II
100	2973.10	II
15	2974.72	I
100	2979.46	II
12	2982.67	I
150	3001.67	II
120	3017.31	II
300	3027.02	II
300	3028.86	II
100	3030.79	II
120	3034.46	II
100	3035.92	II
100	3037.72	II
100	3039.59	II
100	3044.09	II
100	3045.56	II
120	3047.56	II
100	3054.34	II
100	3054.68	II
100	3059.11	II
100	3062.49	II
100	3063.30	II
100	3070.89	II
100	3071.53	II
100	3075.73	II
120	3088.17	II
100	3092.09	II
120	3092.90	II
100	3094.01	II
100	3095.10	II
100	3097.13	II
100	3117.98	II
120	3118.16	II
10	3126.199	I
300	3141.33	II
100	3143.72	II
100 p	3148.68	II
100	3164.43	II
100	3165.65	II
100	3188.74	II
120	3194.58	II
500	3198.59	II
60	3208.96	II
120	3209.36	II
120	3213.74	II
150	3214.33	II
150	3218.19	II
120	3224.82	II
120	3229.57	II

Ne I and II			Ne I and II			Ne I and II			Ne I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
200	3230.07	II	10	3701.225	I	250	6182.146	I	500	8830.907	I
120	3230.42	II	150	3709.62	II	150	6217.281	I	7000	8853.867	I
120	3232.02	II	250	3713.08	II	150	6266.495	I	1000	8865.306	I
150	3232.37	II	250	3727.11	II	60	6304.789	I	1000	8865.755	I
100	3243.40	II	800	3766.26	II	100	6334.428	I	3000	8919.501	I
100	3244.10	II	1000	3777.13	II	120	6382.992	I	2000	8988.57	I
100	3248.34	II	100	3818.43	II	200	6402.246	I	100	9079.46	II
100	3250.36	II	120	3829.75	II	150	6506.528	I	6000	9148.67	I
150	3297.73	II	150	4219.74	II	60	6532.882	I	6000	9201.76	I
150	3309.74	II	100	4233.85	II	150	6598.953	I	4000	9220.06	I
300	3319.72	II	120	4250.65	II	70	6652.093	I	2000	9221.58	I
1000	3323.74	II	120	4369.86	II	90	6678.276	I	2000	9226.69	I
150	3327.15	II	70	4379.40	II	20	6717.043	I	1000	9275.52	I
100	3329.16	II	150	4379.55	II	100	6929.467	I	200	9287.56	II
200	3334.84	II	100	4385.06	II	90	7024.050	I	6000	9300.85	I
150	3344.40	II	200	4391.99	II	100	7032.413	I	1500	9310.58	I
300	3345.45	II	150	4397.99	II	50	7051.292	I	3000	9313.97	I
150	3345.83	II	150	4409.30	II	80	7059.107	I	6000	9326.51	I
200	3355.02	II	100	4413.22	II	100	7173.938	I	2000	9373.31	I
120	3357.82	II	100	4421.39	II	150	7213.20	II	5000	9425.38	I
200	3360.60	II	100	4428.52	II	150	7235.19	II	3000	9459.21	I
120	3362.16	II	100	4428.63	II	100	7245.167	I	5000	9486.68	I
100	3362.71	II	150	4430.90	II	150	7343.94	II	5000	9534.16	I
120	3367.22	II	150	4430.94	II	40	7472.439	I	3000	9547.40	I
12	3369.808	I	120	4457.05	II	90	7488.871	I	120	9577.01	II
40	3369.908	I	100	4522.72	II	100	7492.10	II	1000	9665.42	I
100	3371.80	II	10	4537.754	I	150	7522.82	II	100	9808.86	II
500	3378.22	II	10	4540.380	I	80	7535.774	I	800	10295.42	I
150	3388.42	II	100	4569.06	II	60	7544.044	I	2000	10562.41	I
120	3388.94	II	15	4704.395	I	100	7724.628	I	1500	10798.07	I
300	3392.80	II	12	4708.862	I	120	7740.74	II	2000	10844.48	I
100	3404.82	II	10	4710.067	I	300	7839.055	I	3000	11143.020	I
120	3406.95	II	10	4712.066	I	120	7926.20	II	3500	11177.528	I
100	3413.15	II	15	4715.347	I	400	7927.118	I	1600	11390.434	I
120	3416.91	II	10	4752.732	I	700	7936.996	I	1100	11409.134	I
120	3417.69	II	12	4788.927	I	2000	7943.181	I	3000	11522.746	I
50	3417.904	I	10	4790.22	I	2000	8082.458	I	1500	11525.020	I
15	3418.006	I	10	4827.344	I	100	8084.34	II	950	11536.344	I
120	3428.69	II	10	4884.917	I	1000	8118.549	I	500	11601.537	I
60	3447.703	I	4	5005.159	I	600	8128.911	I	1200	11614.081	I
50	3454.195	I	10	5037.751	I	3000	8136.406	I	300	11688.002	I
100	3456.61	II	10	5144.938	I	2500	8259.379	I	2000	11766.792	I
100	3459.32	II	25	5330.778	I	100	8264.81	II	1500	11789.044	I
25	3460.524	I	20	5341.094	I	2500	8266.077	I	500	11789.889	I
30	3464.339	I	8	5343.283	I	800	8267.117	I	1000	11984.912	I
30	3466.579	I	60	5400.562	I	6000	8300.326	I	3000	12066.334	I
60	3472.571	I	5	5562.766	I	100	8315.00	II	800	12459.389	I
150	3479.52	II	10	5656.659	I	1500	8365.749	I	1000	12689.201	I
200	3480.72	II	5	5719.225	I	100	8372.11	II	1100	12912.014	I
200	3481.93	II	12	5748.298	I	8000	8377.606	I	700	13219.241	I
25	3498.064	I	80	5764.419	I	1000	8417.159	I	800	15230.714	I
30	3501.216	I	12	5804.450	I	4000	8418.427	I	400	17161.930	I
25	3515.191	I	40	5820.156	I	1500	8463.358	I	400	18035.80	I
150	3520.472	I	500	5852.488	I	800	8484.444	I	1000	18083.21	I
120	3542.85	II	100	5872.828	I	5000	8495.360	I	350	18221.11	I
120	3557.80	II	100	5881.895	I	600	8544.696	I	250	18227.02	I
100	3561.20	II	60	5902.462	I	1000	8571.352	I	2500	18276.68	I
250	3568.50	II	60	5906.429	I	4000	8591.259	I	2000	18282.62	I
100	3574.18	II	100	5944.834	I	6000	8634.647	I	1200	18303.97	I
200	3574.61	II	100	5965.471	I	3000	8647.041	I	250	18359.12	I
50	3593.526	I	100	5974.627	I	15000	8654.383	I	1200	18384.85	I
30	3593.640	I	120	5975.534	I	4000	8655.522	I	2000	18389.95	I
15	3600.169	I	80	5987.907	I	100	8668.26	II	1000	18402.84	I
20	3633.665	I	100	6029.997	I	5000	8679.492	I	1200	18422.39	I
150	3643.93	II	100	6074.338	I	5000	8681.921	I	300	18458.65	I
200	3664.07	II	80	6096.163	I	2000	8704.112	I	400	18475.79	I
20	3682.243	I	60	6128.450	I	4000	8771.656	I	900	18591.55	I
12	3685.736	I	100	6143.063	I	12000	8780.621	I	1600	18597.70	I
200	3694.21	II	120	6163.594	I	10000	8783.753	I	350	18618.96	I

Ne I and II

Intensity	Wavelength	
550	18625.16	I
1200	21041.295	I
750	21708.145	I
300	22247.35	I
350	22428.13	I
2250	22530.40	I
400	22661.81	I
600	23100.51	I
1000	23260.30	I
1050	23373.00	I
850	23565.36	I
3500	23636.52	I
300	23701.64	I
1100	23709.2	I
1800	23951.42	I
600	23956.46	I
1000	23978.12	I
200	24098.54	I
500	24161.42	I
600	24249.64	I
1500	24365.05	I
800	24371.60	I
400	24447.85	I
700	24459.4	I
300	24776.46	I
550	24928.88	I
250	25161.69	I
650	25524.37	I
125	28386.21	I
150	30200.	I
250	33173.09	I
450	33352.35	I
1300	33901.	I
2200	33912.10	I
600	34131.31	I
100	34471.44	I
120	35834.78	I

Ne III

Refs. 365,371,402 - R.L.K.

Vacuum

20	251.14	III
20	251.56	III
20	251.73	III
40	267.06	III
40	267.52	III
20	267.71	III
40	283.18	III
160	283.21	III
110	283.69	III
40	283.89	III
220	301.12	III
220	313.05	III
220	313.68	III
40	313.95	III
220	379.31	III
285	488.10	III
220	488.87	III
450	489.50	III
70	489.64	III
220	490.31	III
360	491.05	III
20	1255.03	III
110	1255.68	III
160	1257.19	III

Air

200	2086.96	III
300	2089.43	III
240	2092.44	III

Ne III

Intensity	Wavelength	
400	2095.54	III
200	2161.22	III
300	2163.77	III
200	2180.89	III
200	2209.35	III
200	2211.85	III
240	2213.76	III
300	2216.07	III
240	2263.21	III
200	2264.91	III
300	2412.73	III
240	2412.94	III
200	2413.78	III
200	2473.40	III
800	2590.04	III
600	2593.60	III
400	2595.68	III
300	2610.03	III
240	2613.41	III
200	2615.87	III
200	2638.70	III
200	2641.07	III
600	2677.90	III
500	2678.64	III

Ne IV

Refs. 69,364,388,400, 413,430 - R.L.K.

Vacuum

15	151.82	IV
15	152.23	IV
15	158.65	IV
15	158.82	IV
80	172.62	IV
80	177.16	IV
150	186.58	IV
100	194.28	IV
100	208.48	IV
100	208.73	IV
80	208.90	IV
150	212.56	IV
140	223.24	IV
120	223.60	IV
140	234.32	IV
120	234.70	IV
50	357.83	IV
200	358.72	IV
125	387.14	IV
100	388.22	IV
150	421.61	IV
140	469.77	IV
200	469.82	IV
180	469.87	IV
140	469.92	IV
120	521.74	IV
140	521.82	IV
80	541.13	IV
100	542.07	IV
150	543.89	IV

Air

65	2018.44	IV
110	2022.19	IV
30	2203.88	IV
10	2220.81	IV
250	2258.02	IV
175	2262.08	IV
110	2264.54	IV
550	2285.79	IV
30	2293.14	IV

Ne IV

Intensity	Wavelength	
250	2293.49	IV
250	2363.28	IV
110	2365.49	IV
250	2350.84	IV
450	2352.52	IV
700	2357.96	IV
250	2362.68	IV
350	2372.16	IV
65	2384.20	IV
350	2384.95	IV

Ne V

Refs. 69,388,389,400,413 - R.L.K.

Vacuum

66	119.01	V
200	122.52	V
66	125.12	V
45	131.99	V
50	132.04	V
150	140.76	V
150	140.79	V
100	142.44	V
100	142.50	V
150	142.72	V
100	143.27	V
150	143.34	V
150	147.13	V
66	151.23	V
120	151.42	V
45	154.50	V
100	164.02	V
100	164.14	V
500	173.93	V
400	357.96	V
500	358.47	V
500	359.38	V
1000	365.59	V
800	416.20	V
250	480.41	V
150	481.28	V
250	481.36	V
500	482.99	V
400	568.42	V
250	569.76	V
500	569.83	V
250	572.11	V
800	572.34	V

Air

75	2227.42	V
110	2232.41	V
65	2245.48	V
65	2259.57	V
65	2263.39	V
250	2265.71	V

NEPTUNIUM (Np)

Z = 93

Np I

Ref. 93 - J.G.C.

Air

300	3481.93	I
300 h	3501.50	I
300 l	3986.89	I
300 s	5044.66	I
300 l	5601.70	I
300 l	5652.75	I
300 l	5784.39	I

Np I

Intensity	Wavelength	
300 l	5878.04	I
300 s	6011.22	I
300	6056.09	I
300 s	6073.90	I
300 s	6080.05	I
300 l	6120.49	I
300	6188.59	I
300 l	6200.00	I
300 s	6215.90	I
300 s	6317.84	I
300 l	6341.38	I
300 l	6566.11	I
300 l	6720.68	I
300 s	6751.32	I
300 s	6795.21	I
300 l	6802.62	I
300 l	6805.81	I
300 s	6816.44	I
300 l	6865.45	I
300 s	6907.13	I
300 h	6912.91	I
1000 s	6930.31	I
300 l	6963.63	I
3000 s	6972.09	I
300	7014.02	I
300 l	7018.91	I
300 s	7039.14	I
300 s	7080.01	I
300 l	7174.83	I
300 l	7184.93	I
300 l	7284.28	I
300 l	7292.29	I
300 l	7332.52	I
300 s	7370.60	I
300 l	7381.03	I
300 l	7381.65	I
300 l	7402.70	I
300 s	7512.22	I
300 l	7515.15	I
300 l	7546.05	I
300 l	7624.83	I
300	7626.85	I
300 s	7681.01	I
300 s	7685.25	I
1000 l	7735.14	I
300 l	7761.61	I
1000 l	7765.75	I
300 s	7776.07	I
300	7787.46	I
1000 l	7791.38	I
300 l	7851.44	I
300 l	7887.88	I
300 l	7901.71	I
300 l	7975.98	I
300 h	8080.32	I
300 s	8124.59	I
300	8155.11	I
300 l	8167.42	I
300 l	8183.06	I
300 l	8188.61	I
300 l	8247.82	I
300 l	8287.11	I
300 s	8287.75	I
300 l	8306.22	I
300 s	8313.66	I
1000 l	8339.12	I
300	8356.79	I
300 l	8367.11	I
3000	8372.88	I

Np I		
Intensity	Wavelength	
3000	8529.96	I
1000 s	8696.23	I
1000 s	8906.02	I
1000	8942.70	I
1000 s	9004.75	I
1000 l	9006.31	I
10000 l	9016.18	I
3000 l	9141.30	I
3000 s	9379.33	I
3000 l	9468.66	I
3000 s	9679.13	I
3000 l	9930.55	I
10000 l	10091.99	I
10000 s	10817.45	I
10000 l	11695.15	I
10000 l	11776.64	I
10000 s	12148.18	I
10000 s	12377.42	I
10000 l	12407.99	I
10000 l	13834.33	I

NICKEL (Ni)

Z = 28

Ni I and II		
Refs. 1,294 - C.H.C.		
Vacuum		
500	1317.22	II
400	1335.20	II
500	1370.14	II
1000	1741.55	II
500	1748.28	II
Air		
1000	2165.55	II
2000	2169.10	II
2000	2174.67	II
1500	2175.15	II
500	2177.09	II
400	2177.36	II
400	2179.35	II
800	2180.47	II
800	2184.60	II
2500	2185.50	II
3000	2192.09	II
600	2201.41	II
5000	2205.55	II
4000	2206.72	II
6000	2216.48	II
800	2220.40	II
500	2221.06	II
900	2222.96	II
500	2242.68	II
500	2253.85	II
1000	2264.46	II
2000	2270.21	II
800	2277.28	II
400	2278.32	II
800	2278.77	II
500	2287.65	II
1600	2289.98	I
400	2296.55	II
400	2297.14	II
630	2300.78	I
1000	2303.00	II
2000	2310.96	I
1700	2312.34	I
1400	2313.66	I
1400	2313.98	I

Ni I and II		
Intensity	Wavelength	
1000	2316.04	II
1400	2317.16	I
500	2319.75	II
2600	2320.03	I
1900	2321.38	I
240	2322.68	I
1400	2325.79	I
940	2329.96	I
500	2334.58	II
460	2337.49	I
160	2337.82	I
500	2341.20	II
1200	2345.54	I
190	2346.63	I
400	2347.52	I
160	2360.63	I
200	2362.06	I
1000	2375.42	II
240	2386.58	I
1000	2394.52	II
2000	2416.13	II
240	2419.31	I
85	2421.23	I
70	2423.33	I
70	2423.66	I
70	2424.03	I
500	2437.89	II
85	2453.99	I
160	2472.06	I
85	2476.87	I
500	2510.87	II
500	2565.92	II
500	2606.26	II
500	2609.94	II
500	2615.06	II
45	2696.49	I
150	2798.65	I
250	2821.29	I
500	2864.02	II
50	2865.50	I
60	2907.46	I
25	2914.01	I
500	2943.91	I
570	2981.65	I
250	2984.13	I
500	2992.60	I
1000	2994.46	I
4000	3002.49	I
2200	3003.63	I
3700	3012.00	I
350	3019.14	I
120	3031.87	I
1700	3037.94	I
150	3045.01	I
3500	3050.82	I
1500	3054.32	I
1900	3057.64	I
500	3064.62	I
420	3080.76	I
260	3097.12	I
210	3099.12	I
2600	3101.55	I
1300	3101.88	I
220	3105.47	I
270	3114.12	I
2900	3134.11	I
55	3145.72	I
55	3181.74	I
100	3184.37	I

Ni I and II		
Intensity	Wavelength	
55	3195.57	I
150	3197.11	I
55	3202.14	I
180	3214.06	I
180	3217.83	I
100	3221.27	I
150	3221.65	I
210	3225.02	I
1100	3232.96	I
290	3234.65	I
600	3243.06	I
100	3248.46	I
120	3250.74	I
100	3271.12	I
120	3282.70	I
400	3292.87	II
500	3297.60	II
400	3305.71	II
660	3315.66	I
330	3320.26	I
310	3322.31	I
2000	3331.88	II
400	3335.64	II
500	3338.09	II
500	3348.84	II
500	3349.24	II
600	3358.68	II
330	3361.56	I
500	3363.45	II
330	3365.77	I
330	3366.17	I
65	3366.81	I
65	3367.89	I
2900	3369.57	I
400	3371.99	I
260	3374.22	I
130	3374.64	I
500	3378.97	II
3300	3380.57	I
240	3380.85	I
1300	3391.05	I
3300	3392.99	I
500	3401.05	II
130	3409.58	I
330	3413.48	I
330	3413.94	I
8200	3414.76	I
1600	3423.71	I
2600	3433.56	I
990	3437.28	I
4800	3446.26	I
1300	3452.89	I
5000	3458.47	I
5000	3461.65	I
200	3467.50	I
240	3469.49	I
1600	3472.54	I
550	3483.77	I
130	3485.89	I
5500	3492.96	I
660	3500.85	I
65	3502.60	I
55	3507.69	I
2600	3510.34	I
260	3513.93	I
6600	3515.05	I
660	3519.77	I
8200	3524.54	I
110	3527.98	I

Ni I and II		
Intensity	Wavelength	
330	3548.18	I
55	3551.53	I
65	3561.75	I
5000	3566.37	I
990	3571.87	I
130	3587.93	I
1300	3597.70	I
1300	3610.46	I
530	3612.74	I
6600	3619.39	I
130	3624.73	I
200	3664.10	I
130	3669.24	I
180	3670.43	I
260	3674.15	I
160	3688.42	I
80	3693.93	I
120	3722.48	I
150	3736.81	I
60	3739.23	I
600	3775.57	I
700	3783.53	I
700	3807.14	I
110	3831.69	I
1200	3858.30	I
30	3889.67	I
35	3972.17	I
110	3973.56	I
110	4401.55	I
85	4459.04	I
18	4462.46	I
55	4470.48	I
35	4592.53	I
18	4600.37	I
65	4605.00	I
18	4606.23	I
75	4648.66	I
23	4686.22	I
110	4714.42	I
22	4715.78	I
30	4756.52	I
15	4763.95	I
45	4786.54	I
22	4807.00	I
22 h	4829.03	I
19	4831.18	I
45	4855.41	I
30	4866.27	I
17	4873.44	I
40	4904.41	I
22	4918.36	I
16	4935.83	I
45	4980.16	I
45	4984.13	I
500	4992.02	II
16 h	5000.34	I
18	5012.46	I
50	5017.59	I
100	5035.37	I
16	5048.85	I
100	5080.52	I
65	5081.11	I
26 h	5084.08	I
18	5099.32	I
26 h	5099.95	I
21	5115.40	I
18 h	5129.38	I
23	5137.08	I
23 h	5142.77	I

Ni I and II

Intensity	Wavelength	
40 h	5146.48	I
40 h	5155.76	I
16	5168.66	I
13	5176.56	I
8	5435.87	I
180	5476.91	I
6	5510.00	I
6	5578.73	I
9	5587.86	I
13	5592.28	I
9	5614.79	I
5 h	5625.33	I
4	5649.70	I
5	5664.02	I
12	5682.20	I
8	5695.00	I
23	5709.56	I
10	5711.90	I
10	5715.09	I
16	5754.68	I
8	5760.85	I
10	5857.76	I
10	5892.88	I
10	6108.12	I
10	6176.81	I
10	6191.18	I
13	6256.36	I
10	6314.66	I
16	6643.64	I
22	6767.77	I
9	6772.32	I
10	6914.56	I
5	7110.90	I
26	7122.20	I
6	7182.00	I
5	7197.02	I
5	7261.93	I
5	7291.45	I
4	7385.24	I
16	7393.60	I
16	7409.35	I
5	7414.51	I
23	7422.28	I
13	7522.76	I
9	7525.12	I
19	7555.60	I
8	7574.05	I
23	7617.00	I
9	7619.21	I
16	7714.32	I
5 h	7715.58	I
19	7727.61	I
19	7748.89	I
10	7788.94	I
13	7797.59	I
2	7917.44	I
1000	8096.75	II
500	8114.21	II
700	8121.48	II
2	8809.42	I
9	8862.55	I
500 w	9900.92	II

Ni III

Ref. 422 - C.H.C.

Vacuum

100	625.68	III
500	630.71	III
200	637.54	III

Ni III

Intensity	Wavelength	
200	662.37	III
150	663.57	III
500	676.94	III
200	700.17	III
300	713.33	III
300	713.38	III
500	718.48	III
200	721.26	III
300	722.09	III
250	725.20	III
500	729.82	III
250	730.11	III
400	731.70	III
300	732.16	III
200	738.26	III
300	747.99	III
200	749.68	III
300	750.05	III
200	752.02	III
300	757.80	III
250	758.73	III
250	758.27	III
400	770.22	III
200	772.04	III
500	778.81	III
200 d	785.02	III
300	788.04	III
200	788.30	III
200	805.01	III
500	811.57	III
500	826.14	III
200	826.50	III
500	842.14	III
400	845.24	III
300	847.43	III
200	857.09	III
300	860.64	III
300	862.88	III
300	863.22	III
300	867.51	III
200	869.70	III
200	870.84	III
300	973.79	III
400	979.59	III
200	1428.87	III
200	1434.31	III
200	1451.50	III
300	1604.54	III
300	1652.87	III
200	1653.12	III
250	1656.13	III
200	1661.79	III
400	1687.90	III
1000	1692.51	III
200	1707.35	III
200	1707.43	III
800	1709.90	III
650	1715.30	III
500	1719.46	III
200	1721.26	III
400	1722.28	III
250	1733.13	III
500	1738.25	III
300	1739.78	III
300	1741.96	III
550	1747.01	III
300	1752.43	III
400	1753.01	III
800	1764.69	III

Ni III

Intensity	Wavelength	
500	1767.94	III
2000	1769.64	III
400	1776.07	III
200	1788.30	III
250	1790.40	III
200	1790.93	III
200	1791.64	III
200	1794.90	III
300	1807.24	III
200	1811.69	III
300	1819.28	III
800	1823.06	III
400	1830.01	III
200	1830.08	III
650	1847.28	III
800	1854.15	III
300	1858.75	III
200	1930.43	III
200	1952.54	III

Ni IV

Ref. 415 - C.H.C.

Vacuum

33	392.68	IV
32	393.24	IV
49	424.40	IV
57	444.21	IV
67	469.67	IV
65	471.24	IV
65	485.42	IV
66	536.28	IV
67	537.96	IV
58	1345.72	IV
69	1357.07	IV
76	1398.19	IV
74	1411.45	IV
69	1419.58	IV
74	1421.22	IV
70	1427.45	IV
67	1428.93	IV
67	1435.24	IV
70	1438.82	IV
73	1449.01	IV
76	1452.22	IV
70	1455.42	IV
69	1472.63	IV
68	1476.82	IV
73	1482.25	IV
67	1489.53	IV
72	1489.83	IV
69	1493.01	IV
74	1493.67	IV
68	1498.71	IV
71	1498.77	IV
72	1498.90	IV
67	1499.97	IV
70	1512.74	IV
70	1516.66	IV
73	1520.63	IV
75	1525.31	IV
74	1527.68	IV
74	1527.80	IV
76	1534.71	IV
73	1537.25	IV
69	1538.93	IV
75	1543.41	IV
74	1546.23	IV
68	1548.04	IV
69	1557.28	IV

Ni IV

Intensity	Wavelength	
67	1560.18	IV

Ni V

Ref. 416 - C.H.C.

Vacuum

29	304.02	V
55	315.24	V
56	315.71	V
63	336.79	V
68	343.93	V
78	347.34	V
70	347.46	V
67	347.72	V
71	348.10	V
69	350.77	V
69	353.59	V
72	354.18	V
76	354.42	V
68	354.49	V
68	355.61	V
70	355.78	V
65	357.37	V
69	358.57	V
68	358.58	V
66	359.47	V
69	365.62	V
70	370.62	V
67	371.31	V
68	371.76	V
67	373.60	V
72	377.68	V
70	393.91	V
66	394.31	V
66	395.24	V
41	400.59	V

NIOBIUM (Nb)

Z = 41

Nb I and II

Ref. 1 - C.H.C.

Air

3300	2029.32	II
3000	2032.99	II
2000	2109.42	II
1700	2125.21	II
1100	2126.54	II
1500	2131.18	II
370	2295.68	II
280	2302.08	II
170	2376.40	II
110	2387.09	II
140	2387.52	II
45	2388.27	II
160	2398.48	II
55	2405.34	II
55	2405.85	II
140	2412.46	II
160	2416.99	II
140	2418.69	II
75	2433.80	II
40	2435.95	II
35	2436.33	I
45	2437.42	II
40	2442.14	II
28	2442.68	II
65	2451.87	II
65	2453.95	II
55	2458.09	II

Nb I and II			Nb I and II			Nb I and II			Nb I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
65	2462.89	I	800	2875.39	II	200	3283.46	II	2000	3535.30	I
35	2466.73	I	270	2876.95	II	230	3285.66	I	1300	3537.48	I
55	2469.08	I	530	2877.03	II	200	3287.59	I	250	3540.96	II
110	2477.38	II	100	2880.72	II	160	3287.92	I	500	3544.02	I
65	2478.29	II	570	2883.18	II	160	3292.02	II	250	3544.65	I
65	2479.94	II	280	2888.83	II	320	3296.01	I	300	3550.45	I
35	2483.88	II	470	2897.81	II	160	3299.61	I	250	3554.52	I
110	2504.65	I	400	2899.24	II	120	3304.83	I	1000	3554.66	I
110	2511.00	II	470	2908.24	II	120	3308.05	I	630	3563.50	I
110	2521.40	II	670	2910.59	II	120	3310.47	I	630	3563.62	I
390	2544.80	II	470	2911.74	II	400	3312.60	I	1500	3575.85	I
110	2551.38	II	1100	2927.81	II	200	3315.22	I	200	3577.72	I
130	2556.94	II	110	2931.47	II	200	3318.98	I	5000	3580.27	I
130	2562.41	II	870	2941.54	II	120	3319.26	I	500	3584.97	I
130	2565.41	I	110 h	2945.88	II	120	3319.58	II	750	3589.11	I
100	2569.03	I	110	2946.12	II	240	3326.62	I	500	3589.36	I
110	2571.33	II	110	2946.90	II	170	3329.36	I	500	3593.97	I
200	2578.74	I	1100	2950.88	II	110	3332.16	I	500	3602.56	I
390	2583.99	II	400	2972.57	II	130	3341.60	II	300	3619.51	II
390	2590.94	II	320	2974.10	II	1300	3341.97	I	200	3621.03	I
270	2592.20	I	210	2977.68	II	1300	3343.71	I	200	3639.33	I
130	2616.48	I	200	2982.11	II	130	3346.93	I	420	3649.85	I
130	2623.51	I	330	2990.26	II	1700	3349.06	I	250	3650.81	I
130	2627.44	I	470	2994.73	II	420	3349.52	I	400	3651.19	II
130	2628.49	I	140	3024.74	II	340	3354.74	I	200	3659.61	II
200	2642.24	II	350	3028.44	II	130	3357.04	I	630	3660.37	I
320	2646.26	II	300	3032.77	II	1700	3358.42	I	900	3664.70	I
330	2647.50	I	100	3044.76	II	130	3365.58	II	220	3669.01	I
240	2649.52	I	150	3048.10	I	340	3366.96	I	270	3674.78	I
330	2654.45	I	110	3053.09	I	130	3369.16	II	1500	3697.85	I
310	2656.08	II	100	3055.52	II	170	3371.33	I	330	3711.34	I
160	2657.62	I	220	3064.53	II	350	3374.92	I	3300	3713.01	I
110	2665.25	II	110	3069.68	II	270	3380.41	I	480	3716.99	I
110	2666.59	II	100	3070.90	II	130	3380.86	I	2700	3726.24	I
110	2667.30	II	110	3071.56	II	170	3386.24	II	270	3738.42	I
130	2668.29	I	100	3073.24	II	350	3392.34	I	2700	3739.80	I
400	2671.93	II	400	3076.87	II	170	3395.93	I	670	3740.73	II
200	2673.57	II	110	3080.35	II	120	3399.40	I	270	3741.78	I
200	2675.94	II	1800	3094.18	II	230	3405.41	I	1700	3742.39	I
130	2687.15	I	140	3099.19	II	130	3406.13	I	250	3753.18	I
160	2691.77	II	150	3111.45	I	270	3408.38	I	210	3755.77	I
1000	2697.06	II	270	3127.53	II	230	3408.68	II	530	3763.49	I
320	2698.86	II	1500	3130.79	II	180	3409.19	II	350	3765.08	I
320	2702.20	II	390	3145.40	II	230	3412.94	II	250	3766.13	I
150	2702.52	II	140	3151.87	I	180	3415.97	I	530	3771.85	I
470	2716.62	II	1200	3163.40	II	180	3423.76	I	870	3781.01	I
470	2721.98	II	150	3175.78	II	230	3425.42	II	1700	3787.06	I
310	2733.26	II	390	3180.29	II	130	3425.85	I	1300	3790.15	I
110	2737.09	II	200	3187.49	I	230	3426.57	II	3500	3791.21	I
200	2746.91	I	300	3191.10	II	230	3427.45	I	2700	3798.12	I
200	2748.85	I	150	3191.43	II	130	3429.04	I	270	3801.30	I
190	2753.01	I	1000	3194.98	II	180	3432.70	II	2700	3802.92	I
280	2758.61	I	120	3203.35	II	180	3440.59	II	670	3803.88	I
240	2768.13	II	300	3206.34	II	170	3463.81	I	530	3804.74	I
310	2773.20	I	390	3215.60	II	180	3465.86	I	670	3810.49	I
270	2780.24	II	800	3225.48	II	130	3469.44	I	530	3811.03	I
130	2782.36	I	140	3229.56	II	100	3471.19	I	530	3815.51	I
110	2793.05	II	400	3236.40	II	140	3473.02	I	210	3818.86	II
190	2827.08	II	200	3247.47	II	290	3478.69	I	210	3819.15	I
150	2836.24	I	120	3248.94	II	200	3479.56	II	670	3824.88	I
110	2840.94	I	160	3249.52	I	100	3484.05	II	350	3835.18	I
250	2841.15	II	320	3254.07	II	230	3491.03	I	250	3836.45	I
280	2842.65	II	230	3260.56	II	200	3497.81	I	210	3845.90	I
160	2846.28	II	160	3263.37	II	500	3498.63	I	290	3858.95	I
110	2851.45	I	160	3264.59	I	460	3507.96	I	350	3863.38	I
240	2861.09	II	120	3270.47	I	200	3510.26	II	270	3867.92	I
100	2864.32	I	100	3270.76	I	200	3515.42	II	530	3877.56	I
100	2865.61	II	200	3272.07	I	200	3517.67	II	870	3878.82	I
500	2868.52	II	160	3277.67	I	200	3520.06	I	670	3883.14	I

Nb I and II			Nb I and II			Nb I and II			Nb I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
1100	3885.44	I	190	4419.44	I	65	5203.22	I	25	5628.26	I
670	3885.68	I	230 c	4437.22	I	35	5205.13	I	65	5629.17	I
210	3886.07	I	290	4447.18	I	85 c	5219.10	I	35 c	5635.42	I
580	3891.30	I	140	4456.80	I	65	5225.16	I	170	5642.11	I
210	3908.97	I	140	4457.42	I	150	5232.81	I	35	5645.30	I
670	3914.70	I	140	4469.71	I	85 c	5237.43	I	17	5654.14	I
530	3920.20	I	140	4471.29	I	29	5240.39	I	130	5664.71	I
670	3937.44	I	140	4472.53	I	150 d	5251.62	I	170	5665.63	I
520	3943.67	I	150	4503.04	I		5251.81	I	17	5666.86	I
250	3965.69	I	530	4523.41	I	75	5253.03	I	65cw	5671.02	I
910 d	3966.09	I	480	4546.82	I	85	5253.93	I	85	5671.91	I
210	3971.85	I	370	4564.53	I	50	5269.92	I	25	5677.47	I
1100	4032.52	I	720	4573.08	I	270	5271.53	I	25	5693.09	I
250	4039.53	I	480	4581.62	I	25	5272.48	I	35 d	5697.90	I
16000 c	4058.94	I	1200	4606.77	I	130 c	5276.20	I		5698.03	I
210	4059.51	I	170	4616.17	I	29 c	5279.43	I	40	5706.16	I
350	4060.79	I	450	4630.11	I	50	5285.26	I	85	5706.48	I
210	4068.26	I	450	4648.95	I	35	5296.34	I	29	5709.33	I
12000	4079.73	I	110	4649.27	I	50	5315.55	I	17	5715.59	I
270	4084.86	I	450	4663.83	I	17	5317.01	I	65	5716.35	I
440	4100.40	I	340	4666.24	I	250	5318.60	I	25	5725.66	I
6700	4100.92	I	240	4667.22	I	50	5319.49	I	130	5729.19	I
310	4116.90	I	580	4672.09	I	75	5334.87	I	21	5737.36	I
5300	4123.81	I	530	4675.37	I	25	5336.81	I	13	5738.20	I
670	4129.43	I	110	4678.48	I	50	5340.80	I	85	5751.44	I
770	4129.93	I	320	4685.14	I	25	5343.58	I	110	5760.34	I
2300	4137.10	I	130 c	4706.14	I	460	5344.17	I	65	5764.99	I
440	4139.44	I	260	4708.29	I	340	5350.74	I	29	5771.08	I
2700	4139.71	I	150	4713.50	I	40	5353.28	I	50 c	5776.07	I
350	4143.21	I	110 c	4733.89	I	25	5355.31	I	17	5780.34	I
870	4150.12	I	220 c	4749.70	I	40	5355.70	I	85	5787.54	I
4400	4152.58	I	110	4816.38	I	29	5359.19	I	17	5789.79	I
870	4163.47	I	110 c	4848.37	I	17	5362.01	I	50	5794.24	I
4400	4163.66	I	130 c	4967.78	I	40	5375.27	I	50	5804.03	I
4000	4164.66	I	110	4973.14	I	40	5381.34	I	29 h	5815.33	I
3500	4168.13	I	190	4988.97	I	17	5388.30	I	110	5819.43	I
310	4184.44	I	85	5000.95	I	21	5395.86	I	35	5820.62	I
1200	4190.88	I	65	5002.25	I	29	5396.33	I	75	5834.90	I
870	4192.07	I	40	5013.27	I	29	5411.24	I	25	5838.15	I
870	4195.09	I	230	5017.75	I	21	5416.30	I	130 d	5838.64	I
1300	4195.66	I	40	5019.51	I	65	5422.44	I	50	5842.47	I
310	4198.51	I	150	5026.36	I	21	5431.26	I	17	5846.09	I
350	4201.52	I	40	5030.13	I	110	5437.27	I	65	5866.47	I
870	4205.31	I	210	5039.04	I	19	5448.31	I	35	5874.70	I
350	4214.73	I	40	5047.96	I	19	5456.19	I	17	5877.79	I
420	4217.94	I	170	5058.01	I	40	5458.04	I	40	5893.44	I
420	4229.15	I	65	5059.35	I	19 h	5468.10	I	190cw	5900.62	I
250	4255.44	I	130	5065.25	I	40	5481.00	I	40 c	5903.80	I
770	4262.05	I	40	5077.40	I	13	5483.09	I	29	5927.41	I
420	4266.02	I	750	5078.96	I	19	5483.49	I	40 c	5934.16	I
290	4270.69	I	40 c	5094.41	I	13	5491.06	I	40	5957.70	I
400	4286.99	I	420	5095.30	I	17	5499.53	I	150	5983.22	I
580	4299.60	I	170	5100.16	I	40	5504.58	I	65	5986.08	I
580	4300.99	I	170	5120.30	I	17	5509.12	I	85cw	5997.93	I
120	4309.56	I	85	5121.80	I	35 c	5512.82	I	50	6029.75	I
390	4311.27	I	85	5127.66	I	17	5517.39	I	50	6031.84	I
120	4312.45	I	40	5133.34	I	50	5523.57	I	50	6045.50	I
350	4326.33	I	210	5134.75	I	25	5541.47	I	25	6048.72	I
120	4327.38	I	75	5140.58	I	85	5551.35	I	29	6056.65	I
390	4331.37	I	75	5147.54	I	29	5563.00	I	29	6107.71	I
140	4342.82	I	40	5150.64	I	17 c	5571.44	I	40	6142.51	I
140	4348.65	I	75	5152.63	I	35 c	5576.16	I	50	6148.13	I
110	4349.03	I	250	5160.33	I	35	5578.29	I	50	6164.32	I
290	4351.57	I	250	5164.38	I	50	5586.97	I	29	6213.06	I
210	4368.43	I	230	5180.31	I	17 c	5590.95	I	75	6221.96	I
140	4377.96	I	110	5186.98	I	13	5594.89	I	40 c	6251.76	I
130	4388.36	I	190	5189.20	I	17 c	5599.59	I	21	6260.77	I
160	4392.69	I	170	5193.08	I	40	5603.52	I	85 c	6430.46	I
330	4410.21	I	150	5195.84	I	13	5603.93	I	50 c	6433.22	I

Nb I and II

Intensity	Wavelength	
17	6497.84	I
65	6544.61	I
15	6574.73	I
19cw	6591.00	I
19	6606.16	I
19	6607.28	I
35	6614.15	I
19	6626.98	I
210cw	6660.84	I
150cw	6677.33	I
65	6701.20	I
130 c	6723.62	I
75	6739.88	I
25	6795.31	I
85	6828.11	I
25 c	6849.35	I
19	6870.92	I
40	6876.36	I
25 c	6902.89	I
35	6908.07	I
40	6918.32	I
17	6946.07	I
17	6972.49	I
25	6986.09	I
85	6990.32	I
17 c	6996.11	I
21	7023.48	I
17	7038.04	I
190 c	7046.81	I
8	7066.41	I
8	7075.23	I
40 c	7098.94	I
17cw	7102.01	I
19	7119.31	I
15	7122.95	I
35	7126.17	I
17	7130.06	I
130	7159.43	I
17	7191.37	I
19 c	7208.94	I
50	7252.35	I
15	7274.81	I
13	7317.03	I
17 c	7323.92	I
29cw	7328.38	I
65 c	7353.16	I
190cw	7372.50	I
13	7419.83	I
15	7436.02	I
19	7478.20	I
65	7515.93	I
29 c	7519.77	I
170 c	7574.58	I
17 c	7583.21	I
13	7639.81	I
13	7647.71	I
25	7703.33	I
75 c	7726.68	I
25	7757.31	I
6	7787.11	I
13cw	7873.41	I
35	7885.31	I
25	7938.89	I
8	7954.76	I
40	8135.20	I
13cw	8240.00	I
29cw	8320.93	I
29	8346.08	I
10	8350.04	I

Nb I and II

Intensity	Wavelength	
17	8439.77	I
17cw	8475.98	I
25	8526.99	I
13 c	8547.25	I
17 c	8560.54	I
17	8575.87	I
21 c	8697.55	I
21	8740.96	I
21	8767.97	I
29cw	8815.56	I
35	8905.78	I

Nb III

Ref. 392 - C.H.C.

Vacuum

60	1314.56	III
50	1319.15	III
60	1431.92	III
60	1433.39	III
50	1435.26	III
80	1445.43	III
80	1445.98	III
80	1447.09	III
50	1448.50	III
60	1451.63	III
100	1456.68	III
80	1484.73	III
50	1486.79	III
100	1495.94	III
80	1498.02	III
80	1499.45	III
50	1501.53	III
100	1501.99	III
60	1505.03	III
50	1509.71	III
50	1512.34	III
50	1513.25	III
80	1513.81	III
50	1517.38	III
100	1524.91	III
60	1532.98	III
60	1537.50	III
50	1566.92	III
50	1570.19	III
50	1586.82	III
100	1590.21	III
80	1598.86	III
80	1604.72	III
80	1639.51	III
100	1682.77	III
60	1684.40	III
100	1705.44	III
100	1707.14	III
50	1739.30	III
50	1758.63	III
60	1763.72	III
50	1808.70	III
50	1863.13	III
100	1892.92	III
100	1938.84	III
60 h	1979.07	III
50	1985.15	III
50	1997.11	III

Air

50 h	2007.28	III
50	2032.47	III
50	2060.29	III
80 h	2130.24	III
60	2206.01	III

Nb III

Intensity	Wavelength	
60	2240.31	III
60	2244.19	III
60	2265.63	III
80	2273.92	III
100	2275.23	III
80	2279.36	III
100	2281.51	III
80	2284.40	III
100	2290.36	III
60	2304.78	III
50	2309.92	III
100	2313.30	III
50	2330.22	III
100	2338.09	III
80	2344.12	III
90	2349.21	III
80	2355.54	III
100	2362.06	III
80	2362.50	III
80	2365.70	III
100	2372.73	III
100	2387.41	III
80	2388.23	III
50	2404.23	III
80	2404.89	III
100	2413.94	III
60	2414.50	III
100	2421.91	III
50	2437.74	III
60	2446.45	III
100	2456.99	III
50	2460.34	III
50	2460.45	III
50	2463.72	III
80	2468.72	III
60	2469.39	III
80	2475.87	III
50	2486.02	III
60	2488.74	III
60	2493.02	III
100	2499.73	III
60	2508.53	III
50	2511.95	III
100	2545.64	III
80	2557.94	III
50	2567.44	III
60	2593.75	III
80	2598.86	III
50	2628.67	III
80	2633.17	III
80	2657.99	III
50	2937.71	III
80	3001.84	III
80	3142.26	III
60	3266.11	III

Nb IV

Ref. 407 - C.H.C.

Vacuum

12	542.38	IV
12	543.09	IV
12	545.21	IV
10	559.94	IV
10	566.22	IV
18	981.27	IV
60	993.54	IV
18	996.16	IV
50	1002.76	IV
400	1005.72	IV

Nb IV

Intensity	Wavelength	
500	1007.05	IV
500	1010.19	IV
45	1030.27	IV
100	1116.08	IV
150	1120.02	IV
50	1447.48	IV
40	1473.43	IV
40	1487.23	IV
60	1502.30	IV
60	1524.36	IV
50	1534.06	IV
40	1635.68	IV
40	1910.70	IV
60	1922.41	IV
60	1978.22	IV

Air

40	2027.50	IV
65	2032.53	IV
40	2034.67	IV
40	2068.62	IV
55	2084.07	IV
35	2093.12	IV
50	2093.30	IV
20	2122.68	IV
25	2130.23	IV
45	2146.36	IV
18	2249.98	IV

Nb V

Ref. 431 - C.H.C.

Vacuum

80	464.55	V
80	468.32	V
60	753.01	V
80	763.77	V
80	774.02	V
40	1007.02	V
50	1044.90	V
70	1212.21	V
100	1258.87	V
40	1267.60	V
100	1758.33	V
100	1877.34	V

NITROGEN (N)

Z = 7

N I and II

Ref. 213 - R.L.K.

Vacuum

285	644.634	II
360	644.837	II
450	645.178	II
140	647.50	I
360	660.286	II
170	671.016	II
285	671.386	II
150	671.630	II
160	671.773	II
170	672.001	II
350	692.70	I
285	746.984	II
650	775.965	II
90	885.67	I
90	909.697	I
80	910.278	I
40	910.645	I
450	915.612	II
450	915.962	II

N I and II

Intensity	Wavelength	
550	916.012	II
650	916.701	II
90	953.415	I
100	953.655	I
130	953.970	I
130	963.990	I
115	964.626	I
70	965.041	I
90	1067.614	I
60	1068.612	I
450	1083.990	II
600	1084.580	II
430	1085.546	II
650	1085.701	II
175	1097.237	I
115	1098.095	I
115	1098.260	I
105	1100.360	I
40	1100.465	I
90	1101.291	I
360	1134.165	I
385	1134.415	I
410	1134.980	I
105	1143.65	I
130	1163.884	I
60	1164.206	I
105	1164.325	I
270	1167.448	I
105	1168.334	I
60	1168.417	I
195	1168.536	I
230	1176.510	I
105	1176.630	I
195	1177.695	I
410	1199.550	I
385	1200.223	I
360	1200.710	I
175	1225.026	I
160	1225.37	I
130	1228.41	I
160	1228.79	I
360	1243.179	I
315	1243.306	I
290	1310.540	I
250	1310.95	I
230	1319.00	I
315	1319.68	I
115	1326.57	I
115	1327.92	I
360	1411.94	I
700	1492.625	I
490	1492.820	I
640	1494.675	I
775	1742.729	I
700	1745.252	I
	Air	
160	2095.53	II
70	2096.20	II
110	2096.86	II
110	2130.18	II
160	2142.78	II
160	2206.09	II
160	2286.69	II
110	2288.44	II
220	2316.49	II
160	2316.69	II
285	2317.05	II
160	2461.27	II
110	2496.83	II

N I and II

Intensity	Wavelength	
70	2496.97	II
110	2520.22	II
160	2520.79	II
220	2522.23	II
110	2590.94	II
160	2709.84	II
110	2799.22	II
110	2823.64	II
160	2885.27	II
220	3006.83	II
360	3437.15	II
285	3838.37	II
360	3919.00	II
450	3955.85	II
1000	3995.00	II
360	4035.08	II
550	4041.31	II
360	4043.53	II
140	4099.94	I
185	4109.95	I
285	4176.16	II
285	4227.74	II
285	4236.91	II
220	4237.05	II
450	4241.78	II
285	4432.74	II
650	4447.03	II
360	4530.41	II
550	4601.48	II
450	4607.16	II
360	4613.87	II
450	4621.39	II
870	4630.54	II
550	4643.08	II
285	4788.13	II
450	4803.29	II
180	4847.38	I
285	4895.11	II
160	4914.94	I
210	4935.12	I
160	4950.23	I
350	4963.98	I
285	4987.37	II
450	4994.36	II
650	5001.48	II
360	5002.70	II
870	5005.15	II
550	5007.32	II
450	5010.62	II
360	5016.39	II
360	5025.66	II
550	5045.10	II
185	5281.20	I
140	5292.68	I
450	5495.67	II
285	5535.36	II
650	5666.63	II
550	5676.02	II
870	5679.56	II
450	5686.21	II
450	5710.77	II
285	5747.30	II
700	5752.50	I
240	5764.75	I
265	5829.54	I
235	5854.04	I
360	5927.81	II
550	5931.78	II
285	5940.24	II

N I and II

Intensity	Wavelength	
650	5941.65	II
285	5952.39	II
160	5999.43	I
210	6008.47	I
285	6167.76	II
360	6379.62	II
185	6411.65	I
210	6420.64	I
210	6423.02	I
210	6428.32	I
185	6437.68	I
235	6440.94	I
185	6457.90	I
300	6468.44	I
750	6482.05	II
360	6482.70	I
300	6483.75	I
265	6481.71	I
325	6484.80	I
160	6491.22	I
210	6499.54	I
185	6506.31	I
750	6610.56	II
185	6622.54	I
185	6636.94	I
235	6644.96	I
185	6646.50	I
235	6653.46	I
210	6656.51	I
185	6722.62	I
210	7398.64	I
160	7406.12	I
265	7406.24	I
685	7423.64	I
785	7442.29	I
900	7468.31	I
185	7608.80	I
450	7762.24	II
400	8184.87	I
400	8188.02	I
250	8200.36	I
300	8210.72	I
570	8216.34	I
400	8223.14	I
400	8242.39	I
550	8438.74	II
500	8567.74	I
570	8594.00	I
650	8629.24	I
500	8655.89	I
220	8676.08	II
700	8680.28	I
650	8683.40	I
500	8686.15	I
110	8687.43	II
110 h	8699.00	II
500	8703.25	I
160 h	8710.54	II
570	8711.70	I
500	8718.83	I
250	8728.89	I
200	8747.36	I
500	9386.80	I
570	9392.79	I
250	9460.68	I
200	9863.33	I
160 h	9865.41	II
110 h	9868.21	II
160 h	9887.39	II

N I and II

Intensity	Wavelength	
220 h	9891.09	II
160 h	9961.86	II
220 h	9969.34	II
285 h	10023.27	II
220 h	10035.45	II
220 h	10065.15	II
160 h	10070.12	II
250	10105.13	I
300	10108.89	I
350	10112.48	I
400	10114.64	I
110 h	10126.27	II
250	10539.57	I
200	12074.51	I
380	12186.82	I
225	12288.97	I
290	12328.76	I
310	12381.65	I
180	12438.40	I
510	12461.25	I
920	12469.62	I
500	13429.61	I
840	13581.33	I
180	13587.73	I
180	13602.27	I
290	13624.18	I
250	14757.07	I
100	14868.87	I
160	14966.60	I
180	15582.27	I
120 s	17516.58	I
100 l	17584.86	I
100	17878.26	I

N III

Refs. 66,213 – R.L.K.

Vacuum		
500	257.95	III
650	258.50	III
700	259.19	III
800	260.09	III
800	261.28	III
500	262.91	III
500	265.23	III
500	265.27	III
500	268.70	III
150	314.715	III
200	314.850	III
90	314.877	III
600	323.26	III
500	338.35	III
500	340.20	III
500	351.98	III
120	362.833	III
150	362.881	III
150	362.946	III
90	362.985	III
300	374.204	III
350	374.441	III
500	387.48	III
250	451.869	III
300	452.226	III
500	684.996	III
570	685.513	III
650	685.816	III
500	686.335	III
500	763.336	III
570	764.359	III
250	771.544	III

N III

Intensity	Wavelength	
300	771.901	III
350	772.385	III
200	772.891	III
150	772.975	III
650	979.842	III
700	979.919	III
900	989.790	III
700	991.514	III
1000	991.579	III
500	1183.031	III
570	1184.550	III
150	1387.371	III
250	1729.945	III
570	1747.848	III
350	1751.218	III
650	1751.657	III
150	1804.486	III
200	1805.669	III
150	1846.42	III
350	1885.06	III
400	1885.22	III
200	1907.99	III
150	1919.55	III
150	1919.77	III
300	1920.65	III
150	1920.84	III
200	1921.30	III
	Air	
200	2064.01	III
250	2064.42	III
120	2068.68	III
90	2071.09	III
90	2117.59	III
90	2121.50	III
90	2147.31	III
200	2188.20	III
150	2188.38	III
250 w	2682.18	III
90	2689.20	III
120	3367.34	III
90	3754.67	III
120	3771.05	III
90	3938.52	III
150	3998.63	III
200	4003.58	III
250	4097.33	III
200	4103.43	III
120	4195.76	III
150	4200.10	III
90	4332.91	III
120	4345.68	III
300	4379.11	III
90	4510.91	III
120	4514.86	III
90	4634.14	III
120	4640.64	III
90	4858.82	III
150	4867.15	III
90	5314.35	III
200	5320.82	III
150	5327.18	III
90	6454.11	III
120	6467.02	III

N IV

Refs. 108,212 - R.L.K.

Vacuum

400	181.75	IV
400	191.7	IV

N IV

Intensity	Wavelength	
400	192.9	IV
500	196.87	IV
500	197.23	IV
500	202.60	IV
500	205.94	IV
500	205.97	IV
500	206.03	IV
500	217.20	IV
500 d	217.90	IV
500 d	223.4	IV
800 w	225.12	IV
800	225.21	IV
600 w	234.12	IV
600 w	234.20	IV
600 w	234.25	IV
550	236.07	IV
500	237.99	IV
500 w	238.7	IV
600	238.80	IV
500 w	239.62	IV
900	247.20	IV
500 w	248.43	IV
500 w	248.46	IV
500 w	248.48	IV
600	260.45	IV
650	270.99	IV
250	283.42	IV
300	283.48	IV
350	283.58	IV
600	285.56	IV
600 w	297.7	IV
700	297.82	IV
650	300.32	IV
90	303.123	IV
500	303.28	IV
150	315.053	IV
120	322.503	IV
150	322.570	IV
200	322.724	IV
120	323.175	IV
300	335.050	IV
500 w	351.93	IV
700	353.06	IV
500	420.77	IV
650	463.74	IV
570	765.148	IV
520	921.992	IV
500	922.519	IV
480	923.057	IV
520	921.992	IV
500	922.519	IV
520	924.283	IV
1000	955.335	IV
150 w	1036.16	IV
90	1078.71	IV
90	1188.01	IV
1000	1718.55	IV
	Air	
90	2080.34	IV
90 w	2318.09	IV
150	2477.69	IV
250	2645.65	IV
300	2646.18	IV
350	2646.96	IV
90	3078.25	IV
90	3463.37	IV
570	3478.71	IV
500	3482.99	IV
400	3484.96	IV

N IV

Intensity	Wavelength	
90	3747.54	IV
150	4057.76	IV
90	4606.33	IV
150	6380.77	IV

N V

Refs. 66,107,318 - R.L.K.

Vacuum

52	166.947	V
52	186.069	V
62	186.153	V
90	209.303	V
90	247.561	V
120	247.706	V
150	266.196	V
200	266.379	V
90	713.518	V
150	713.860	V
150	748.195	V
200	748.291	V
1000	1238.821	V
900	1242.804	V
90	1549.336	V
200 l	1616.33	V
350 l	1619.69	V
90 w	1860.37	V
	Air	
60 l	2859.16	V
90 l	2974.52	V
150 w	2980.78	V
250 w	2981.31	V
60 w	2998.43	V
350	4603.73	V
250	4619.98	V
200 w	4944.56	V
60 w	7618.46	V

OSMIUM (Os)

Z = 76

Os I and II

Ref. 1 - C.H.C.

Air

9600	2001.45	I
13000	2003.73	I
9000	2004.78	
17000	2010.15	I
29000	2018.14	I
29000	2020.26	
14000	2022.76	I
14000	2028.23	I
18000	2034.44	I
26000	2045.36	I
8600	2058.69	I
	2058.78	I
13000	2061.69	I
7800	2067.21	II
4200	2070.67	II
7200	2076.95	I
7200	2078.09	
14000	2079.97	I
2900	2082.54	I
2900	2089.03	I
2900	2089.21	I
6000	2097.60	I
5300	2100.63	I
2100	2117.66	I
4800	2117.96	I
6600	2119.79	

Os I and II

Intensity	Wavelength	
1900	2123.84	I
5300	2137.11	I
2400	2149.97	
2600	2154.59	I
1300	2157.84	I
1200	2158.53	I
2400	2161.00	
3100	2166.90	I
1100	2167.75	I
2100	2171.65	I
960	2184.68	I
840	2194.39	II
760	2202.49	I
600	2227.98	I
1100	2234.61	I
1300	2252.15	I
2000	2255.85	II
1400	2264.60	I
360	2268.28	I
960	2270.17	I
1400	2282.26	II
840	2283.67	I
570	2289.32	I
380	2297.31	I
660	2308.31	I
190	2313.75	II
550	2320.18	I
310	2323.98	I
660	2324.24	I
330	2326.99	I
310	2334.56	I
720	2336.80	II
430	2338.63	I
290	2340.69	I
430	2343.74	I
260	2345.75	I
430	2347.38	I
230	2350.23	II
360	2352.99	I
120	2355.28	II
240	2356.92	I
240	2357.25	I
310	2362.41	I
900	2362.77	I
500	2367.35	II
290	2369.24	I
500	2370.70	I
480	2371.18	I
95	2375.06	II
2600	2377.03	I
260	2377.61	I
900	2379.39	I
240	2384.62	I
1700	2387.29	I
330	2394.29	I
290	2395.39	I
1100	2395.88	I
220	2396.78	I
960	2401.13	I
260	2402.23	I
200	2403.54	I
330	2403.85	I
95	2405.08	II
290	2405.45	I
200	2405.96	I
360	2408.67	I
240	2410.98	I
290	2414.52	I
530	2417.99	I

Os I and II			Os I and II			Os I and II			Os I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
530	2418.53	I	3800	2637.13	I	450	2964.06	I	310	3327.42	I
95	2420.02	II	1900	2644.11	I	740	2970.97	I	960	3336.15	I
200	2423.07	II	340	2646.89	I	450	2977.64	I	110	3351.74	I
70	2424.02	II	380	2647.73	I	510	2982.90	I	120	3353.91	
500	2424.56	I	380	2649.34	I	340	2983.49		230	3357.97	I
1400	2424.97	I	490	2656.68	I	260	2997.65	I	250	3361.15	I
240	2426.81	I	1900	2658.60	I	330	3013.07	I	190	3364.12	I
70	2427.90	II	640	2659.83	I	570	3017.25	I	120	3370.20	I
380	2431.19	I	380	2661.18	I	4400	3018.04	I	960	3370.59	I
380	2431.61	I	40	2664.29	II	480	3019.38	I	160	3372.08	I
360	2446.02	I	580	2674.57	I	1100	3030.70	I	120	3378.68	I
900	2450.74	I	400	2674.88	I	2900	3040.90	I	310	3384.00	I
530	2451.73	I	2100	2689.82	I	210	3043.50	I	190	3385.94	I
530	2453.90	I	510	2699.59	I	120	3042.74	II	620	3387.84	I
110	2454.91	II	580	2706.70	I	230	3049.46	I	120	3401.17	I
530	2456.46	I	3000	2714.64	I	210	3050.39	I	620	3401.86	I
1800	2461.42	I	580	2715.36	I	8600	3058.66	I	250	3402.51	I
110	2468.90	II	1300	2720.04	I	290	3060.30	I	120	3408.76	I
290	2472.28	I	850	2721.86	I	570	3062.19	I	120	3412.74	I
290	2474.78	I	580	2730.61	I	210	3069.94	I	120	3421.69	I
900	2476.84	I	40	2731.36	II	360	3074.08	I	150	3427.67	I
360	2482.43	I	580	2732.80	I	290	3074.96	I	250	3440.60	I
530	2486.24	II	690	2761.42	I	290	3077.44	I	120	3444.46	I
4500	2488.55	I	470	2763.27	I	1100	3077.72	I	160	3445.55	I
290	2491.02	I	340	2765.04	I	360	3078.11	I	310	3449.20	I
290	2491.69	I	960	2770.71	I	230	3078.38	I	120	3458.38	I
360	2492.42	I	300	2776.91	I	230	3090.08	I	120	3465.44	I
2600	2498.41	I	740	2782.55	I	270	3093.59	I	120	3478.53	I
330	2499.92	I	40	2783.88	II	310	3101.53	I	120	3482.11	I
330	2502.29	I	640	2786.31	I	360	3105.99	I	120	3487.46	I
500	2504.39	I	230	2793.99	I	310	3108.98	I	120	3490.33	
260	2504.51	I	230	2794.19	I	620	3109.38	I	160	3498.54	I
35	2507.18	II	530	2796.73	I	250	3111.09	I	250	3501.16	I
70	2509.71	II	320	2804.07	I	310	3118.33	I	620	3504.66	I
660	2512.87	I	2800	2806.91	I	480	3131.12	I	440	3512.99	I
2400	2513.25	I	470	2808.94	I	250	3152.67	I	310	3518.72	I
660	2515.04	I	420	2813.84	I	290	3153.61	I	120	3520.00	I
500	2517.92	I	740	2814.20	I	3100	3156.25	I	480	3523.64	I
660	2518.44	I	300	2815.78	I	250	3156.78	I	120	3526.04	I
200	2519.29	I	420	2829.27	I	310	3166.51	I	1200	3528.60	I
330	2519.79	I	230	2837.42	I	180	3173.93	II	230	3530.06	I
200	2532.44	I	470	2838.17	I	420	3178.06	I	230	3532.80	I
780	2538.00	II	5100	2838.63	I	230	3181.88	I	120	3533.41	I
240	2538.10	I	740	2841.60	I	230	3185.33	I	230	3542.71	I
1000	2542.51	I	2300	2844.40	I	310	3186.98	I	960	3559.79	I
30	2548.83	II	420	2846.39	I	310	3189.46	I	1200	3560.86	I
310	2554.46	I	420	2848.25	I	310	3194.23	I	120	3562.34	I
190	2563.16	II	1500	2850.76	I	150	3213.31	II	310	3569.78	I
600	2566.49	I	1500	2860.96	I	1900	3232.06	I	120	3574.08	I
290	2566.88	I	35	2863.37	II	290	3238.63	I	120	3587.32	I
480	2568.83	I	360	2874.96	I	190	3241.04	I	620	3598.11	I
340	2571.78	I	300	2878.40	I	120	3248.00	I	190	3601.83	I
150	2578.32	II	35	2879.39	II	190	3254.91	I	95	3604.48	II
130	2580.03	II	30	2880.20	II	190	3256.92	I	250	3616.57	I
360	2581.05	I	260	2896.06	I	190	3260.30	I	120	3619.43	I
740	2581.96	I	9600	2909.06	I	3100	3262.29	I	450	3640.33	I
1000	2590.76	I	2100	2912.33	I	380	3262.75	I	230	3654.49	I
200	2591.98	I	530	2917.26	I	3100	3267.94	I	330	3656.90	I
170	2596.00	II	2100	2919.79	I	620	3269.21	I	120	3666.31	I
210	2609.20	I	300	2925.57	I	190	3272.16	I	480	3670.89	I
380	2609.56	I	360	2929.51	I	530	3275.20	I	120	3675.45	I
400	2610.78	I	510	2931.28	I	330	3277.97	I	250	3689.06	I
470	2612.63	I	260	2934.64	I	190	3288.84	I	190	3703.25	I
1800	2613.06	I	200	2942.85	I	1200	3290.26	I	120	3706.56	I
800	2619.94	I	1100 h	2948.23	I	7600	3301.56	I	120	3709.14	I
230	2620.62	I	1400	2949.53	I	250	3306.23	I	230	3713.73	I
530	2621.82	I	210 d	2949.81	I	620	3310.91	I	210	3719.52	I
380	2628.48	I	300	2961.01	I	120	3315.42	I	230	3720.13	I
27	2631.22	II	530	2962.15	I	250	3324.33	I	180	3746.47	I

Os I and II			Os I and II			Os I and II			Os I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
3700	3752.52	I	100	4338.75	I	13	5552.88	I	7	7789.96	I
100	3757.12	I	100	4351.53	I	11	5560.62	I	7	7852.17	I
130	3766.30	I	210	4365.67	I	16	5580.66	I	6	7981.20	I
120	3768.14	I	110	4370.66	I	80	5584.44	I	7	8041.29	I
120	3774.40	I	520	4394.86	I	8	5600.50	I			
110	3774.62	I	160	4397.26	I	35	5620.08	I		**OXYGEN (O)**	
120	3776.25	I	160	4402.74	I	9	5637.41	I			
290	3776.99	I	4900	4420.47	I	22	5642.56	I		**Z = 8**	
2100	3782.20	I	100	4432.41	I	28	5645.25	I			
620	3790.14	I	290	4436.32	I	7	5648.98	I		O I and II	
180	3790.73	I	100	4439.64	I	9	5660.21	I	Refs.	66,69,209,210,215	
370	3793.91	I	230	4447.35	I	7	5674.38	I		– R.L.K.	
250	3836.06	I	120	4484.76	I	28	5680.88	I		Vacuum	
150	3840.30	I	110	4548.66	I	11	5709.37	I	250	537.83	II
150	3841.29	I	540	4550.41	I	170	5721.93	I	300	538.26	II
190	3849.94	I	140	4551.30	I	8	5737.89	I	220	539.09	II
230	3857.09	I	170	4616.78	I	8	5739.72	I	200	539.55	II
230	3865.47	I	170	4631.83	I	22	5765.05	I	150	539.85	II
730	3876.77	I	140	4663.82	I	170	5780.82	I	150	644.148	II
250	3881.86	I	670	4793.99	I	40	5800.60	I	200	672.95	II
140	3900.39	I	110	4865.60	I	8	5842.49	I	150	673.77	II
190	3901.71	I	55	5031.83	I	110	5857.76	I	70	685.544	I
100	3930.00	I	45	5039.12	I	28	5860.64	I	900	718.484	II
250	3938.59	I	35	5072.88	I	11	5882.92	I	600	718.562	II
100	3949.78	I	35	5074.77	I	11	5903.98	I	70	744.794	I
200	3961.02	I	35	5079.09	I	11	5906.84	I	70	770.793	I
1000	3963.63	I	90	5103.50	I	7	5908.95	I	90	771.056	I
100	3964.96	I	55	5110.81	I	7	5981.36	I	70	775.321	I
150	3969.67	I	22	5122.23	I	11	5983.22	I	70	791.973	I
110 h	3975.44	I	22	5145.54	I	65	5996.00	I	300	796.66	II
730	3977.23	I	140	5149.74	I	20	6015.79	I	90	804.267	I
100	3988.18	I	28	5152.01	I	7	6054.63	I	70	804.848	I
150	4003.48	I	28	5168.98	I	20	6144.53	I	70	805.295	I
100	4004.02	I	40	5193.52	I	11	6158.03	I	80	805.810	I
150	4005.16	I	270	5202.63	I	35	6227.70	I	240	832.762	II
160	4018.26	I	35	5203.23	I	7	6241.70	I	450	833.332	II
100	4037.84	I	20	5250.46		22	6269.41	I	600	834.467	II
280	4041.92	I	45	5255.82	I	11	6274.94	I	40	877.879	I
160	4048.05	I	55	5265.15	I	11	6286.83	I	80	922.008	I
960	4066.69	I	20	5283.89	I	9	6398.86	I	90	935.193	I
250	4070.86	I	20	5295.65	I	22	6403.15	I	40	948.686	I
190	4071.56	I	40	5298.78	I	9	6448.13	I	90	971.738	I
230	4074.68	I	13	5302.58	I	6	6520.85	I	40	976.448	I
490	4091.82	I	18	5336.23	I	7	6528.87	I	160	988.773	I
120	4100.30	I	11	5346.03	I	7	6533.14	I	40	990.204	I
1200	4112.02	I	13	5352.25	I	11	6538.30	I	250	1025.762	I
180	4124.60	I	110	5376.79	I	11	6576.83	I	90	1027.431	I
180	4128.96	I	16	5403.43	I	8	6614.56	I	160	1039.230	I
2500	4135.78	I	13	5412.14	I	4	6615.43	I	60	1040.942	I
150	4137.84	I	120	5416.34	I	7	6661.81	I	40	1152.152	I
180	4172.57	I	45	5416.69	I	27	6729.56	I	900	1302.168	I
1200	4173.23	I	28	5417.51	I	18	6791.53	I	600	1304.858	I
620	4175.63	I	16	5441.82	I	14	6806.61	I	300	1306.029	I
120	4184.13	I	55	5443.31	I	5	6878.70	I		Air	
320	4189.91	I	22	5446.93	I	4	6901.58	I	30 d	2283.42	II
180	4201.45	I	11	5447.76	I	11	6956.02	I	30 d	2284.89	II
250	4202.06	I	20	5449.37	I	6	6984.95	I	110	2293.32	II
1200	4211.86	I	20	5453.40	I	15	7060.67	I	200	2300.35	II
120	4213.86	I	22	5457.30	I	22	7145.54	I	30 d	2313.05	II
100	4215.16	I	28	5470.00	I	10	7149.89	I	30 d	2316.12	II
170	4233.46	I	13	5474.58	I	4	7184.10	I	30 d	2316.79	II
4900	4260.85	I	13	5475.13	I	10	7206.33	I	50 d	2319.68	II
100	4264.75	I	9	5477.27	I	5	7209.96	I	30 d	2322.15	II
120	4269.61	I	16	5481.85	I	9	7251.16	I	30 d	2339.31	II
100	4285.90	I	22	5509.33	I	6	7253.49	I	110	2411.60	II
560	4293.95	I	9	5516.01	I	6	7375.07	I	80	2425.55	II
560	4311.40	I	270	5523.53	I	9	7407.95	I	250	2433.56	II
110	4326.25	I	22	5546.82	I	26	7602.95	I	80 d	2436.06	II
340	4328.68	I	9	5549.79	I	4	7701.46	I	80	2444.26	II

O I and II		
Intensity	Wavelength	
300	2445.55	II
300	2733.34	II
110	2747.46	II
265	2972.29	I
160	3122.62	II
220	3129.44	II
450	3134.82	II
285	3138.44	II
220	3270.98	II
220	3273.52	II
220	3277.69	II
360	3287.59	II
160	3305.15	II
160	3306.60	II
220	3377.20	II
285	3390.25	II
220	3407.38	II
160	3409.84	II
285	3470.81	II
220	3712.75	II
285	3727.33	II
160	3739.92	II
360	3749.49	II
160	3803.14	II
120	3823.41	I
450	3911.96	II
160	3919.29	II
185	3947.29	I
160	3947.48	I
140	3947.59	I
220	3954.37	II
100	3954.61	I
450	3973.26	II
220	3982.20	II
160	4069.90	II
285	4072.16	II
450	4075.87	II
80 d	4083.91	II
50 d	4087.14	II
150 d	4089.27	II
110	4097.24	II
220	4105.00	II
285	4119.22	II
160	4132.81	II
50	4146.06	II
220	4153.30	II
285	4185.46	II
450	4189.79	II
80	4233.27	I
50 d	4253.74	II
50 d	4253.98	II
50 d	4275.47	II
50 d	4303.78	II
285	4317.14	II
160	4336.86	II
220	4345.56	II
285	4349.43	II
220	4366.90	II
100	4368.25	I
220	4395.95	II
450	4414.91	II
285	4416.98	II
160	4448.21	II
160	4452.38	II
50	4465.45	II
50 d	4466.28	II
50	4467.83	II
50	4469.41	II
360	4590.97	II

O I and II		
Intensity	Wavelength	
285	4596.17	II
80 d	4609.39	II
160	4638.85	II
360	4641.81	II
450	4649.14	II
160	4650.84	II
360	4661.64	II
285	4676.23	II
220	4699.21	II
285	4705.36	II
160	4924.60	II
220	4943.06	II
135	5329.10	I
160	5329.68	I
190	5330.74	I
90	5435.18	I
110	5435.78	I
135	5436.86	I
120	5577.34	I
160	5958.39	I
190	5958.58	I
80	5995.28	I
160	6046.23	I
190	6046.44	I
110	6046.49	I
100	6106.27	I
400	6155.98	I
450	6156.77	I
490	6158.18	I
80	6256.83	I
100	6261.55	I
100	6366.34	I
100	6374.32	I
320	6453.60	I
360	6454.44	I
400	6455.98	I
80	6604.91	I
100	6653.83	I
360	7001.92	I
450	7002.23	I
210	7156.70	I
400	7254.15	I
450	7254.45	I
320	7254.53	I
210	7476.44	I
100	7477.24	I
120	7479.08	I
120	7480.67	I
100	7706.75	I
870	7771.94	I
810	7774.17	I
750	7775.39	I
80	7886.27	I
100	7943.15	I
100	7947.17	I
235	7947.55	I
210	7950.80	I
185	7952.16	I
110	7981.94	I
135	7982.40	I
190	7986.98	I
135	7987.33	I
250	7995.07	I
400	8221.82	I
265	8227.65	I
265	8230.02	I
325	8233.00	I
120	8235.35	I
120	8426.16	I

O I and II		
Intensity	Wavelength	
810	8446.25	I
1000	8446.36	I
935	8446.76	I
325	8820.43	I
160 d	9057.01	I
120	9118.29	I
80	9134.71	I
80	9150.14	I
80	9151.48	I
235	9156.01	I
450	9260.81	I
490	9260.84	I
450	9260.94	I
400	9262.58	I
540	9262.67	I
590	9262.77	I
490	9265.94	I
640	9266.01	I
185	9399.19	I
120	9481.16	I
120 d	9482.88	I
235	9487.43	I
140	9492.71	I
265	9497.97	I
160	9499.30	I
235	9505.59	I
210	9521.96	I
120	9523.36	I
120	9523.96	I
100	9528.28	I
100	9622.13	I
120	9625.29	I
160	9677.38	I
80	9694.66	I
65	9694.91	I
235	9741.50	I
235	9760.65	I
120	9909.05	I
140	9936.98	I
120	9940.41	I
160	9995.31	I
120 d	10421.18	I
590	11286.34	I
640	11286.91	I
490	11287.02	I
490	11287.32	I
490	11295.10	I
540	11297.68	I
590	11302.38	I
265	11358.69	I
490	12464.02	I
450	12570.04	I
120	12990.77	I
160	13076.91	I
700	13163.89	I
750	13164.85	I
640	13165.11	I
160	16212.06	I
120	17966.70	I
590	18021.21	I
120	18041.48	I
120	18042.19	I
120	18046.23	I
140	18229.23	I
540	18243.63	I
140	26173.56	I

O III

Refs. 23,66,210 – R.L.K.

O III		
Intensity	Wavelength Vacuum	
80 d	264.34	III
110	264.48	III
110	266.97	III
150	266.98	III
150	267.03	III
150	277.38	III
80	295.62	III
110	295.66	III
120	295.72	III
150	303.41	III
150	303.46	III
140	303.52	III
160	303.62	III
160	303.69	III
250	303.80	III
200	305.60	III
250	305.66	III
190	305.70	III
300	305.77	III
190	305.84	III
450	320.979	III
300	328.45	III
250	328.74	III
300	345.31	III
110	355.14	III
90	355.33	III
80	355.47	III
200	359.02	III
190	359.22	III
150	359.38	III
210	373.80	III
200	374.00	III
300	374.08	III
190	374.16	III
200	374.33	III
210	374.44	III
450	395.558	III
300	434.98	III
800	507.391	III
900	507.683	III
1000	508.182	III
1000	525.795	III
700	597.818	III
1000	599.598	III
110	609.70	III
160	610.04	III
200	610.75	III
100	610.85	III
800	702.332	III
800	702.822	III
900	702.899	III
1000	703.850	III
600	832.927	III
780	833.742	III
600	835.096	III
800	835.292	III
160	1476.89	III
285	1590.01	III
160	1591.33	III
220	1760.12	III
110	1760.42	III
220	1763.22	III
220	1764.48	III
750	1767.78	III
550	1768.24	III
360	1771.67	III
110	1773.00	III
110	1773.85	III

O III

Intensity	Wavelength	
220	1779.16	III
160	1781.03	III
160	1784.85	III
220	1789.66	III
110	1848.26	III
110	1856.62	III
285	1872.78	III
285	1872.87	III
285	1874.94	III
160	1920.04	III
110	1920.75	III
110	1921.52	III
220	1923.49	III
110	1923.82	III
110	1926.94	III
	Air	
360	2013.27	III
160	2026.96	III
220	2045.67	III
160	2052.74	III
200 d	2390.44	III
80	2394.33	III
80	2422.84	III
80 d	2438.83	III
200	2454.99	III
200	2558.06	III
80	2687.53	III
110	2695.49	III
80	2959.68	III
250	2983.78	III
80	3017.63	III
80	3023.45	III
80	3043.02	III
200	3047.13	III
110	3059.30	III
80	3121.71	III
110	3132.86	III
80	3238.57	III
200	3260.98	III
300	3265.46	III
80	3267.31	III
80	3312.30	III
110	3340.74	III
80	3444.10	III
80	3455.12	III
80	3698.70	III
80	3702.75	III
80	3703.37	III
110	3707.24	III
110	3715.08	III
110	3744.00	III
150	3754.67	III
80	3757.21	III
250	3759.87	III
110	3791.26	III
200	3961.59	III
110	5592.37	III

O IV

Refs. 36,66 - R.L.K.

Vacuum

150	195.86	IV
200	196.01	IV
110	207.18	IV
150	207.24	IV
140	233.46	IV
150	233.50	IV
110	233.52	IV
200	233.56	IV

O IV

Intensity	Wavelength	
110	233.60	IV
90	238.36	IV
180	238.57	IV
110	252.56	IV
110	252.95	IV
150	253.08	IV
300	260.39	IV
250	260.56	IV
300	279.63	IV
375	279.94	IV
110	285.71	IV
150	285.84	IV
200	306.62	IV
150	306.88	IV
700	553.330	IV
775	554.075	IV
850	554.514	IV
700	555.261	IV
580	608.398	IV
640	609.829	IV
270	616.952	IV
150	617.005	IV
200	617.036	IV
520	624.617	IV
580	625.130	IV
640	625.852	IV
200	779.734	IV
315	779.821	IV
360	779.912	IV
200	779.997	IV
640	787.711	IV
520	790.109	IV
700	790.199	IV
200	802.200	IV
160	802.255	IV
130	921.296	IV
160	921.366	IV
200	923.367	IV
130	923.433	IV
200	1338.612	IV
130	1342.992	IV
230	1343.512	IV
	Air	
200	2449.372	IV
200	2450.040	IV
200	2493.44	IV
200	2493.77	IV
200	2507.73	IV
230	2509.19	IV
200	2517.2	IV
160	2836.26	IV
160	2921.45	IV
460	3063.42	IV
410	3071.61	IV
160	3209.66	IV
230	3348.08	IV
270	3349.11	IV
160	3354.27	IV
200	3375.40	IV
130	3378.06	IV
360	3381.20	IV
360	3385.52	IV
270	3396.79	IV
360	3403.52	IV
230	3409.66	IV
410	3411.69	IV
230	3413.64	IV
200	3489.83	IV
160	3492.24	IV

O IV

Intensity	Wavelength	
230	3560.39	IV
270	3563.33	IV
315 w	3725.93	IV
360	3729.03	IV
410	3736.85	IV
230	3744.89	IV

O V

Refs. 24,66 - R.L.K.

Vacuum

80	124.616	V
110	135.523	V
80	138.109	V
110	139.029	V
80	151.447	V
110	151.477	V
150	151.546	V
80	164.574	V
110	164.657	V
80	164.709	V
80	166.235	V
150	167.99	V
110	170.219	V
450	172.169	V
250	185.745	V
375	192.751	V
450	192.799	V
520	192.906	V
80	193.003	V
200	194.593	V
80	202.161	V
80	202.224	V
80	202.283	V
80	202.334	V
150	202.393	V
110	203.78	V
150	203.82	V
100	203.85	V
200	203.89	V
100	203.94	V
300	207.794	V
150	215.040	V
200	215.103	V
250	215.245	V
250	216.018	V
520	220.352	V
80	227.372	V
80	227.469	V
150	227.511	V
80	227.549	V
80	227.634	V
80	227.689	V
150	231.823	V
110	248.459	V
110	286.448	V
1000	629.730	V
230	681.272	V
700	758.678	V
640	759.441	V
580	760.228	V
775	760.445	V
640	761.128	V
700	762.003	V
520	774.518	V
640	1371.292	V
160 w	1506.72	V
315 w	1643.68	V
160	1707.996	V
	Air	

O V

Intensity	Wavelength	
1000	2781.01	V
920	2786.99	V
775	2789.85	V
200	2941.33	V
210	2941.65	V
160	3144.66	V
100	4123.99	V
230 w	4930.27	V
130	5597.91	V
130	6500.24	V

PALLADIUM (Pd)

Z = 46

Pd I and II

Refs. 1,287 - C.H.C.

Air

50	2162.27	II
50	2182.35	II
50	2212.15	II
100 r	2231.59	II
200 r	2296.53	II
50	2351.32	II
50	2362.31	II
75	2367.92	II
60	2372.16	II
50	2388.29	II
60	2414.73	II
75	2418.72	II
75	2424.49	II
100	2426.87	II
100	2430.94	II
100	2433.11	II
100	2435.32	II
150	2446.17	II
75	2446.72	II
1100	2447.91	I
80	2448.15	II
100	2457.29	II
60	2457.76	II
150	2469.29	II
80	2470.06	II
100	2471.18	II
50	2472.55	II
1700	2476.42	I
250	2486.52	II
300	2488.92	II
75	2489.61	II
200	2498.81	II
150	2505.73	II
50	2514.47	II
80	2534.57	II
50 h	2539.44	II
150	2551.84	II
150	2565.51	II
100	2569.56	II
60	2593.24	II
50	2628.24	II
70	2635.92	II
150	2658.75	II
1900	2763.09	I
150 h	2776.85	II
100 h	2787.92	II
50 h	2800.64	II
50 h	2807.59	II
200	2854.59	II
100 h	2871.37	II
100 h	2878.01	II

Pd I and II

Intensity	Wavelength	
520	2922.49	I
50	2980.63	II
650	3002.65	I
45	3009.78	I
1500	3027.91	I
1100	3065.31	I
2600	3114.04	I
270	3142.81	I
11000	3242.70	I
2700	3251.64	I
3500	3258.78	I
460	3287.25	I
3600	3302.13	I
5000	3373.00	I
24000	3404.58	I
13000	3421.24	I
5000	3433.45	I
6400	3441.40	I
7700	3460.77	I
10000	3481.15	I
2000	3489.77	I
12000	3516.94	I
12000	3553.08	I
4500	3571.16	I
20000	3609.55	I
20000	3634.70	I
5500	3690.34	I
1400	3718.91	I
1500	3799.19	I
1500	3832.29	I
2200	3894.20	I
1500	3958.64	I
290	4087.34	I
90	4169.84	I
2500	4212.95	I
180	4473.59	I
55 h	4788.18	I
45 h	4817.51	I
35	4875.43	I
55	5110.81	I
75	5117.02	I
160	5163.84	I
55	5234.86	I
120	5295.63	I
18	5312.57	I
15	5345.10	I
35	5395.24	I
55	5542.80	I
35	5547.02	I
27	5619.44	I
15	5642.69	I
14	5655.42	I
75	5670.07	I
11	5690.14	I
55 h	5695.09	I
18	5736.61	I
23	6774.54	I
65	6784.52	I
4 h	6833.42	I
11	7016.44	I
13 h	7310.06	I
75	7368.12	I
27	7391.92	I
16	7486.90	I
120	7764.03	I
27	7786.67	I
45	7915.80	I
18	7961.08	I
55	8132.82	I

Pd I and II

Intensity	Wavelength	
45	8300.83	I
9 h	8353.58	I
18 h	8532.74	I
16 h	8599.10	I
65	8761.35	I

Pd III

Ref. 424 – L.J.R.

Vacuum

10	688.74	III
20	689.46	III
50	689.54	III
50	695.91	III
200	705.49	III
150	707.80	III
100	709.89	III
100	717.90	III
100	719.47	III
200	727.72	III
150	738.79	III
100	756.85	III
100	757.41	III
500	763.06	III
500	766.42	III
200	772.11	III
200	776.51	III
2000	781.02	III
200	784.99	III
200	787.31	III
200	787.95	III
200	789.58	III
500	794.08	III
500	797.52	III
500	800.03	III
500	800.10	III
500	803.67	III
500	825.35	III
500	840.58	III
500	856.47	III
500	864.04	III
500	880.59	III
500	888.84	III
1000	889.29	III
300	947.78	III
300	965.52	III
100	1505.40	III
200	1517.18	III
200 h	1526.88	III
100	1542.63	III
200 h	1545.95	III
300	1596.89	III
200 h	1606.10	III
150	1630.84	III
50	1679.73	III
100	1704.33	III
50	1706.40	III
200	1719.86	III
500	1741.62	III
400	1758.19	III
4000	1782.55	III
400	1804.91	III
400	1843.49	III
1500	1851.59	III
2000	1852.27	III
1000	1859.21	III
1500	1874.63	III
2000	1885.83	III
1000	1887.40	III
1500	1891.34	III

Pd III

Intensity	Wavelength	
4000	1914.62	III
1000	1930.33	III
2000	1941.64	III
400	1951.56	III
300	1972.29	III
300	1977.53	III

Air

800	2002.16	III
1000	2004.47	III
500	2055.11	III
500	2149.82	III
500	2177.55	III
500	2177.63	III
100	2291.45	III
100	2452.42	III
100	2633.22	III

PHOSPHORUS (P)

Z = 15

P I and II

Ref. 182 – R.L.K.

Vacuum

10	810.24	II
10	865.44	II
20	1249.82	II
20	1301.87	II
20	1304.47	II
15	1304.68	II
35	1305.48	II
25	1309.87	II
60	1310.70	II
20	1373.49	I
20	1377.06	I
20	1377.93	I
25	1379.40	I
25	1381.47	I
50 d	1430.13	I
30	1452.89	II
50	1491.36	I
40	1492.99	I
80	1532.51	II
120	1535.90	II
80	1536.39	II
120	1542.29	II
60	1548.43	I
70	1671.07	I
180	1671.68	I
90	1672.48	I
230	1674.61	I
300	1679.71	I
120	1685.99	I
100	1694.06	I
60	1706.41	I
250	1774.99	I
200	1782.87	I
180	1787.68	I
100	1847.19	I
80	1851.22	I
150	1858.91	I
150	1859.43	I

Air

100	2023.48	I
150	2033.47	I
100	2135.47	I
200	2136.18	I
200	2149.14	I
100	2152.94	I

P I and II

Intensity	Wavelength	
150	2154.08	I
100	2484.19	II
500	2533.99	I
700	2535.61	I
600	2553.25	I
500	2554.90	I
150	2606.06	II
100	2626.18	II
90	2636.76	II
150	3308.92	II
125	3419.34	II
100	3425.00	II
100	4178.48	II
200	4288.60	II
200	4385.35	II
400	4420.71	II
100	4452.46	II
150	4463.00	II
120	4467.98	II
200	4475.26	II
200	4499.24	II
120	4530.81	II
120	4554.83	II
120	4558.07	II
120	4581.71	II
500	4588.04	II
500	4589.86	II
600	4602.08	II
300	4626.70	II
300	4658.31	II
200	4864.42	II
150	4927.20	II
500	4943.53	II
300	4954.39	II
300	4969.71	II
150	5191.41	II
300	5253.52	II
400	5296.13	II
250	5316.07	II
300	5344.75	II
250	5378.20	II
300	5386.88	II
200	5409.72	II
400	5425.91	II
400	5450.74	II
100	5458.31	I
125	5461.20	II
200	5477.75	I
200	5483.55	II
200	5499.73	II
200	5507.19	II
200	5541.14	II
200	5583.27	II
250	5588.34	II
100	5727.71	II
500	6024.18	II
400	6034.04	II
500	6043.12	II
250	6055.50	II
100	6057.86	II
350	6087.82	II
150	6097.68	I
350	6165.59	II
180	6199.01	I
100	6232.29	II
200	6367.27	II
250	6435.32	II
130	6436.31	II
600	6459.99	II

P I and II

Intensity	Wavelength	
600	6503.46	II
600	6507.97	II
150	6713.28	II
120	6717.42	I
100	7165.45	I
150	7175.12	I
120	7176.66	I
100	7505.76	I
250	7845.63	II
120	8278.07	I
150	8367.84	I
100	8531.46	I
100	8613.85	I
150	8637.62	I
250	8741.54	I
50	8872.17	I
30	9525.78	I
25	9593.54	I
20	9734.74	I
25	9750.73	I
50	9796.79	I
25	10084.22	I
6	10529.45	I
8	10581.52	I

P III

Ref. 180 - R.L.K.

Vacuum

90	471.146	III
90	484.278	III
120	498.180	III
200	569.853	III
200	581.831	III
200	844.646	III
150	845.038	III
250	845.664	III
300	847.669	III
200	848.016	III
120	848.465	III
150	848.639	III
250	852.686	III
350	855.624	III
200	859.406	III
500	859.652	III
250	859.729	III
300	913.971	III
300	917.120	III
350	918.665	III
250	921.849	III
200	997.999	III
250	1003.598	III
500	1334.808	III
650	1344.327	III
300	1344.845	III
250	1380.463	III
150	1381.089	III
350	1502.228	III
250	1504.663	III
150	1618.632	III
200	1618.907	III

Air

200	2611.147	III
300	2632.713	III
200	2680.133	III
250	2895.241	III
250	3186.186	III
300	3219.307	III
150	3233.536	III
400	3233.602	III

P III

Intensity	Wavelength	
200	3556.546	III
200	3577.526	III
200	3904.812	III
250	3914.314	III
300	3957.641	III
350	3978.307	III
200	4057.440	III
400	4059.312	III
300	4080.084	III
500	4222.195	III
350	4246.720	III
200	4428.171	III
200	4463.668	III
250	4479.776	III
150	6083.409	III
150	6409.204	III
150	6484.440	III
150	6486.381	III
150	6992.690	III
150	8113.528	III

P IV

Ref. 336 - R.L.K.

Vacuum

90	282.301	IV
90	304.996	IV
120	359.293	IV
150	359.899	IV
120	361.514	IV
150	361.629	IV
120	371.299	IV
150	371.504	IV
200	372.001	IV
500	388.318	IV
120	414.604	IV
200	414.999	IV
250	415.805	IV
250	444.245	IV
300	445.158	IV
250	568.038	IV
350	629.008	IV
400	629.914	IV
500	631.779	IV
350	648.482	IV
300	756.510	IV
300	776.353	IV
650	823.179	IV
700	824.730	IV
800	827.932	IV
250	847.019	IV
350	849.799	IV
200	850.392	IV
700	877.476	IV
1000	950.655	IV
570	1025.563	IV
500	1028.096	IV
570	1030.517	IV
500	1033.111	IV
500	1035.517	IV
570	1118.551	IV
200	1206.422	IV
200	1335.705	IV
500	1366.695	IV
400	1372.674	IV
350	1377.282	IV
500	1484.507	IV
400	1487.788	IV
300	1489.098	IV
250	1862.762	IV

P IV

Intensity	Wavelength	
120	1862.893	IV
200	1863.580	IV
650	1888.523	IV
200	1910.183	IV
120	1985.682	IV
150	1985.851	IV
200	1986.114	IV
150	1987.022	IV

Air

200	2477.823	IV
150	2478.070	IV
250	2478.256	IV
250	2605.506	IV
400	2644.295	IV
300	2724.764	IV
400	2728.770	IV
200	2729.120	IV
500	2739.309	IV
250	2739.872	IV
200	2740.223	IV
200	2961.242	IV
650	3347.736	IV
570	3364.467	IV
400	3371.122	IV
200	3413.543	IV
200	3733.393	IV
300	4249.656	IV
250	4540.288	IV
250	4541.112	IV
150	4548.056	IV
200	4548.449	IV
150	5235.499	IV
150	5989.774	IV
150	6142.605	IV
150	6713.939	IV
120	6715.906	IV
200	7443.657	IV

P V

Ref. 179 - R.L.K.

Vacuum

80	255.59	V
50	255.67	V
110	310.58	V
150	311.34	V
300	328.47	V
250	328.78	V
150	347.23	V
200	348.20	V
110	378.56	V
250	389.50	V
300	390.70	V
150	410.03	V
375	475.60	V
110	534.63	V
80	534.99	V
520	542.57	V
600	544.92	V
450	673.90	V
450	865.45	V
600	871.39	V
250	997.62	V
150	1000.38	V
900	1117.98	V
700	1128.01	V
150	1379.62	V
250	1385.05	V
375	1447.83	V
450	1610.50	V

P V

Intensity	Wavelength	

Air

200	2180.29	V
150	2186.42	V
375	2424.40	V
450	2440.93	V
200	2441.24	V
300	2961.00	V
450	2978.55	V
700	3175.09	V
520	3204.04	V
150	4083.18	V
110	4094.95	V
110	5156.72	V

PLATINUM (Pt)

Z = 78

Pt I and II

Refs. 1,288 - C.H.C.

Vacuum

30	1621.66	II
30	1723.13	II
30	1751.70	II
50 r	1777.09	II
30	1781.86	II
30	1879.09	II
40	1883.05	II
50	1889.52	II
50	1911.70	II
30	1929.25	II
30	1929.68	II
30	1939.80	II
30	1949.90	II
30	1983.74	II

Air

40	2014.93	II
3200	2030.63	I
4400	2032.41	I
100	2036.46	II
40	2041.57	II
5500	2049.37	I
1500	2067.50	I
3000	2084.59	I
1000	2103.33	I
30	2115.57	II
950	2128.61	I
30	2130.69	II
1900	2144.23	I
100	2144.24	II
600	2165.17	I
1500	2174.67	I
30	2190.32	II
400	2202.22	I
50 h	2202.58	II
320	2222.61	I
50 h	2233.11	II
150	2249.30	I
30 h	2240.99	II
100	2245.52	II
30	2251.52	II
30 h	2251.92	II
190	2268.84	I
30 h	2271.72	II
280	2274.38	I
50 h	2287.50	II
30	2288.20	II
150	2289.27	I
150	2292.40	I

Pt I and II		
Intensity	Wavelength	
240	2308.04	I
50	2310.96	II
90	2315.50	I
220	2318.29	I
100	2326.10	I
170	2340.18	I
280	2357.10	I
180	2368.28	I
50	2377.28	II
130	2383.64	I
40	2386.81	I
120	2389.53	I
35	2396.17	I
70	2401.87	I
200	2403.09	I
100	2418.06	I
50	2424.87	II
80	2428.04	I
50	2428.20	I
25	2429.10	I
180	2436.69	I
650	2440.06	I
60	2450.97	I
440	2467.44	I
35	2471.01	I
1000	2487.17	I
25	2488.74	II
200	2490.12	I
160	2495.82	I
240	2498.50	I
50	2505.93	I
120	2508.50	I
50	2514.07	I
60	2515.03	I
240	2515.58	I
140	2524.30	I
40	2529.41	I
50	2536.49	I
160	2539.20	I
18	2549.46	I
50	2552.25	I
50	2596.00	I
70	2603.14	I
30	2616.76	II
50	2619.57	I
30	2625.34	II
1100	2628.03	I
130	2639.35	I
1000	2646.89	I
500	2650.86	I
20	2658.17	I
2800	2659.45	I
40	2674.57	I
440	2677.15	I
200	2698.43	I
2000	2702.40	I
1600	2705.89	I
60	2713.13	I
1300	2719.04	I
130	2729.92	I
1800	2733.96	I
70	2738.48	I
70	2747.61	I
80	2753.86	I
200	2754.92	I
30	2769.84	I
500	2771.67	I
40	2773.24	I
20	2774.00	I

Pt I and II		
Intensity	Wavelength	
50	2774.77	II
50	2793.27	I
100	2794.21	II
40 h	2799.98	II
140	2803.24	I
10	2808.51	I
50	2818.25	I
30 h	2822.27	II
1400	2830.30	I
70	2834.71	I
16	2853.11	I
80 h	2860.68	II
40 h	2865.05	II
40 h	2875.85	II
100 h	2877.52	II
25	2888.20	I
25	2893.22	I
600	2893.86	I
300	2897.87	I
60	2905.90	I
120	2912.26	I
120	2913.54	I
70	2919.34	I
30	2921.38	I
1700	2929.79	I
30	2942.76	I
30	2944.75	I
25	2959.10	I
60	2960.75	I
1800	2997.97	I
35	3001.17	II
220	3002.27	I
30	3017.88	I
30 h	3031.22	II
130	3036.45	I
800	3042.64	I
3200	3064.71	I
30	3071.94	I
130	3100.04	I
320	3139.39	I
140	3156.56	I
120	3200.71	I
320	3204.04	I
30	3230.29	I
20	3233.42	I
20	3250.36	I
40	3251.98	I
160	3255.92	I
25	3268.42	I
25	3281.97	I
120	3290.22	I
500	3301.86	I
60	3315.05	I
35	3323.80	I
340	3408.13	I
35	3427.93	I
60	3483.43	I
160	3485.27	I
120	3628.11	I
70	3638.79	I
70	3643.17	I
50	3663.10	I
80	3671.99	I
80	3674.04	I
35	3699.91	I
18	3706.53	I
20	3801.05	
80	3818.69	I
40	3900.73	I

Pt I and II		
Intensity	Wavelength	
110	3922.96	I
35	3948.40	I
100	3966.36	I
20	3996.57	I
110	4118.69	I
80	4164.56	I
40	4192.43	I
18	4327.06	I
18	4391.83	I
80	4442.55	I
14	4445.55	I
25	4498.76	I
12	4520.90	I
35	4552.42	I
12	4879.53	I
14	5044.04	I
30	5059.48	I
35	5227.66	I
40	5301.02	I
12	5368.99	I
12	5390.79	I
14	5475.77	I
14	5478.50	I
6	5763.57	I
20	5840.12	I
8	5844.84	I
6	6026.04	I
7	6318.37	I
8	6326.58	I
9	6523.45	I
10	6710.42	I
20	6760.02	I
60	6842.60	I
20	7113.73	I
10	8224.74	I

PLUTONIUM (Pu)

Z = 94

Pu I and II Ref. 91 – J.G.C. Air		
10000	2781.40	II
10000	2784.48	II
10000	2806.11	II
10000	2815.77	II
10000	2897.97	II
10000	2898.94	II
10000	2904.25	II
10000	2904.94	II
10000	2910.40	II
10000	2918.00	II
10000	2918.80	II
10000	2926.08	II
10000	2928.25	II
10000	2929.71	II
10000	2930.98	II
10000	2932.32	II
10000	2933.30	II
10000	2938.54	II
10000	2938.95	II
10000	2941.39	II
10000	2945.26	II
10000	2946.00	II
10000	2950.06	II
10000	2951.62	
10000	2954.46	II
10000	2963.47	II

Pu I and II		
Intensity	Wavelength	
10000	2966.84	II
10000	2967.54	II
10000	2972.50	II
10000	2977.81	II
10000	2978.37	II
10000	2980.23	II
10000	2981.23	II
10000	2986.95	II
10000	2988.21	II
10000	2991.31	II
10000	2996.40	II
10000	3000.31	II
10000	3009.57	II
10000	3028.85	II
10000	3042.61	II
10000	3043.12	II
10000	3060.32	II
10000	3069.32	II
10000	3091.33	II
10000	3091.94	II
10000	3092.59	II
10000	3104.12	II
10000	3105.04	II
10000	3106.03	
10000	3123.87	II
10000	3159.21	II
10000	3161.73	II
10000	3163.18	II
10000	3174.49	II
10000	3179.41	II
10000	3185.12	II
10000	3187.60	II
10000	3189.23	II
10000	3193.54	
10000	3193.55	II
10000	3194.56	II
10000	3198.47	II
10000	3200.23	II
10000	3201.00	II
10000	3201.66	II
10000	3204.48	II
10000	3206.80	II
10000	3207.97	II
10000	3215.08	I
10000	3216.15	II
10000	3220.94	II
10000	3224.87	II
10000	3231.86	II
10000	3232.24	
10000	3232.63	II
10000	3241.39	II
10000	3242.96	II
10000	3243.40	II
10000	3244.16	I
10000	3245.25	II
10000	3245.71	
10000	3246.35	II
10000	3247.50	
10000	3247.56	II
10000	3252.08	I
10000	3260.54	II
10000	3265.17	
10000	3273.11	II
10000	3274.71	II
10000	3275.24	I
10000	3292.56	I
10000	3293.61	I
10000	3296.91	I
10000	3297.87	I

Pu I and II

Intensity	Wavelength	
10000	3298.47	II
10000	3301.76	I
10000	3306.59	I
10000	3306.66	I
10000	3307.66	II
10000	3308.75	I
10000	3312.65	II
10000	3315.34	II
10000	3316.96	II
10000	3320.61	I
10000	3320.84	I
10000	3323.48	
10000	3327.19	I
10000	3330.11	
10000	3331.52	II
10000	3332.34	I
10000	3333.03	
10000	3337.71	II
10000	3338.40	II
10000	3338.94	I
10000	3347.87	II
10000	3349.63	I
10000	3351.82	II
10000	3356.61	II
10000	3358.41	II
10000	3358.84	II
10000	3362.26	II
10000	3365.20	I
10000	3365.66	
10000	3368.86	I
10000	3370.64	II
10000	3371.19	I
10000	3375.80	I
10000	3376.76	II
10000	3376.94	II
10000	3377.37	II
10000	3379.51	I
10000	3381.82	I
10000	3381.97	II
10000	3382.70	I
10000	3390.33	II
10000	3391.41	II
10000	3393.67	I
10000	3394.32	I
10000	3418.88	II
10000	3465.10	II
10000	3473.64	II
10000	3483.20	I
10000	3585.87	II
10000	3632.21	II
10000	3699.19	II
10000	3720.59	I
10000	3725.98	I
10000	3726.11	II
10000	3726.79	II
10000	3732.03	II
10000	3744.78	I
10000	3753.63	I
10000	3755.94	I
10000	3757.82	I
10000	3758.34	I
10000	3774.38	I
10000	3776.71	I
10000	3792.22	I
10000	3799.37	I
10000	3805.93	I
10000	3811.40	I
10000	3812.30	II
10000	3827.57	I

Pu I and II

Intensity	Wavelength	
10000	3835.52	I
10000	3836.96	I
10000	3838.92	I
10000	3842.10	I
10000	3851.01	I
10000	3851.85	I
10000	3878.54	I
10000	3895.89	I
10000	3928.53	I
10000	3975.43	II
10000	4097.12	I
10000	4101.96	I
10000	4105.95	II
10000	4111.07	I
10000	4114.91	I
10000	4128.12	I
10000	4129.93	II
10000	4133.01	I
10000	4135.97	I
10000	4140.04	I
10000	4141.20	II
10000	4151.09	I
10000	4151.45	I
10000	4155.46	I
10000	4159.39	II
10000	4167.77	I
10000	4170.95	I
10000	4178.28	II
10000	4189.90	II
10000	4190.06	II
10000	4196.20	II
10000	4206.48	I
10000	4208.23	I
10000	4221.87	I
10000	4224.20	I
10000	4229.77	II
10000	4254.76	II
10000	4261.88	I
10000	4269.77	I
10000	4273.34	II
10000	4281.17	I
10000	4289.08	II
10000	4337.18	II
10000	4352.71	II
10000	4367.41	I
10000	4379.91	II
10000	4385.35	II
10000	4393.93	II
10000	4404.90	I
10000	4441.65	II
10000	4468.54	II
10000	4472.79	II
10000	4493.78	II
10000	4504.91	II
10000	4536.15	II
10000	4735.40	I
10000	4989.34	I
10000	5269.86	I
10000	5381.02	I
10000	5498.50	I
10000	5510.72	I
10000	5537.59	I
10000	5549.62	I
10000	5590.54	I
10000	5592.33	I
10000	5712.39	I
10000	5770.26	I
10000	5839.05	I
10000	5983.35	I

Pu I and II

Intensity	Wavelength	
10000	6012.78	I
10000	6192.80	I
10000	6304.66	I
10000	6449.75	I
10000	6486.71	I
10000	6488.86	I
10000	6488.89	
10000	6535.27	I
10000	6544.21	I
10000	6608.95	I
10000	6672.72	I
10000	6784.66	I
10000	6880.16	I
10000	6891.38	I
10000	7059.23	I
10000	7068.90	I
10000	7092.46	I
10000	7116.88	I
10000	7141.66	I
10000	7177.14	I
10000	7231.09	I
10000	7258.06	I
10000	7322.23	I
10000	7325.97	I
10000	7331.81	I
10000	7431.18	I
10000	7447.99	I
10000	7507.80	I
10000	7526.93	I
10000	7547.45	I
10000	7564.50	I
10000	7571.87	I
10000	7572.93	I
10000	7609.77	I
10000	7689.40	I
10000	7758.20	I
10000	7798.54	I
10000	7953.17	I
10000	8102.54	I
10000	8130.86	I
10000	8309.61	I
10000	8435.47	I
10000	8476.13	I
10000	8495.75	
10000	8597.26	I
10000	8665.02	I
10000	8691.94	I
3000	8729.82	I
3000	8836.16	I
3000	9533.07	I
3000	10046.75	I
3000	11114.82	I
3000	12144.46	I
3000	12231.22	I
3000	15377.31	I
3000	16897.38	I

POLONIUM (Po)

Z = 84

Po I and II

Refs. 47,48 - E.F.W. Air

Intensity	Wavelength	
250 w	2139.02	I
300 h	2203.80	
300	2220.67	I
200	2222.13	I
200	2284.22	

Po I and II

Intensity	Wavelength	
250	2344.61	I
250	2421.72	I
300	2426.09	I
1500 w	2450.08	I
700	2483.94	I
700	2490.53	I
200 h	2502.18	
300	2534.95	I
300	2557.33	I
1500 w	2558.01	I
400	2562.31	
300	2578.80	
400	2587.64	I
200	2637.01	
300	2645.36	I
700 h	2663.33	
200	2671.67	I
600	2761.92	I
400	2800.26	I
250	2824.11	I
300	2866.01	I
400	2919.31	I
600	2958.92	I
2500 w	3003.21	I
450	3069.31	I
200	3115.95	
400	3189.02	I
600	3240.24	I
250	3286.38	I
600	3328.60	I
300	3489.79	
200	3493.65	
400	3588.33	
200	3671.36	
500	3861.93	I
200	4051.98	
1200	4170.52	I
250	4236.13	
200 h	4415.58	
800	4493.21	I
350	4611.44	I
200	4867.12	
400	4876.24	I
450	4946.81	
350	5323.23	I
300	5744.85	I
600	7962.62	I
300	8433.87	I
500	8618.26	I
250	9227.87	

POTASSIUM (K)

Z = 19

K I and II

Refs. 59,76,172,268 - L.J.R. Vacuum

Intensity	Wavelength	
5	261.20	II
25	441.81	II
5	465.08	II
	469.50	II
10	476.03	II
30	495.14	II
30	600.77	II
25	607.93	II
30	612.62	II
3	1725.0	II

K I and II		
Intensity	Wavelength Air	
6	2190.00	II
4	2210.53	II
5	2265.04	II
6	2550.02	II
4	2743.55	II
	2992.12	I
	2992.22	I
	3034.76	I
	3034.92	I
5	3062.18	II
4	3101.79	I
3	3102.04	I
6	3105.00	II
5	3190.07	II
7	3217.16	I
6	3217.62	I
4	3220.60	II
5	3290.65	II
6	3345.32	II
6	3373.60	II
6	3380.62	II
6	3384.86	II
6	3404.24	II
7	3440.05	II
11	3446.37	I
10	3447.38	I
6	3481.11	II
7	3530.75	II
5	3608.88	II
6	3618.49	II
4	3626.42	II
3	3648.84	I
4	3648.98	I
6	3681.54	II
5	3716.60	II
5	3721.34	II
5	3739.13	II
5	3744.42	II
6	3767.36	II
6	3783.19	II
6	3800.14	II
6	3816.56	II
7	3817.50	II
5	3873.74	II
4	3878.62	II
8	3897.92	II
5	3923.00	II
5	3926.36	II
6	3942.53	II
6	3955.21	II
6	3966.72	II
6	3972.58	II
6	3995.10	II
7	4001.24	II
5	4012.10	II
6	4042.59	II
18	4044.14	I
17	4047.21	I
5	4093.69	II
6	4114.99	II
7	4134.72	II
7	4149.19	II
8	4186.24	II
7	4222.97	II
7	4225.67	II
7	4263.40	II
7	4305.00	II
7	4309.10	II

K I and II		
Intensity	Wavelength	
5	4340.03	II
7	4388.16	II
5	4466.65	II
6	4505.33	II
5	4595.65	II
8	4608.45	II
10	4641.88	I
11	4642.37	I
5	4659.38	II
4	4740.91	I
6	4744.35	I
5	4753.93	I
7	4757.39	I
5	4786.49	I
7	4791.05	I
6	4799.75	I
8	4804.35	I
9	4829.23	II
7	4849.86	I
8	4856.09	I
8	4863.48	I
9	4869.76	I
8	4942.02	I
6	4943.29	II
9	4950.82	I
9	4956.15	I
10	4965.03	I
8	5005.60	II
7	5056.27	II
10	5084.23	I
11	5097.17	I
11	5099.20	I
12	5112.25	I
5	5310.24	II
12	5323.28	I
13	5339.69	I
12	5342.97	I
14	5359.57	I
6	5470.13	II
5	5642.73	II
4	5772.32	II
16	5782.38	I
17	5801.75	I
15	5812.15	I
17	5831.89	I
2	5969.64	II
8	6120.27	II
6	6246.59	II
7	6307.29	II
5	6427.96	II
2	6595.00	II
19	6911.08	I
12	6936.28	I
20	6938.77	I
7	6964.18	I
12	6964.67	I
25	7664.90	I
24	7698.96	I
5	7955.37	I
4	7956.83	I
7	8078.11	I
6	8079.62	I
9	8250.18	I
8	8251.74	I
3	8390.22	I
	8391.44	I
2	8417.54	I
1	8420.00	I
11	8503.45	I

K I and II		
Intensity	Wavelength	
10	8505.11	I
4	8763.96	I
3	8767.05	I
13	8902.19	I
12	8904.02	I
5	8923.31	I
4	8925.44	I
7	9347.24	I
3	9349.25	I
6	9351.59	I
15	9595.70	I
14	9597.83	I
6	9949.67	I
5	9954.14	I
9	10479.63	I
5	10482.15	I
8	10487.11	I
17	11019.87	I
16	11022.67	I
17	11690.21	I
16	11769.62	I
17	11772.83	I
	12432.24	I
	12522.11	I
	13377.86	I
	13397.09	I
	15163.08	I
	15168.40	I
	40158.37	I

K III		
Refs. 60,76 – L.J.R. Vacuum		
2	325.28	III
5	327.60	III
25	330.68	III
30	341.92	III
15	348.00	III
30	379.12	III
25	380.48	III
30	382.23	III
15	398.63	III
20	402.10	III
30	406.48	III
40	408.96	III
50	413.79	III
30	414.87	III
30	416.00	III
30	417.54	III
30	418.62	III
75	434.72	III
50	435.68	III
75	444.34	III
75	448.60	III
75	466.79	III
100	470.09	III
75	471.57	III
45	474.92	III
40	479.18	III
10	482.11	III
10	482.41	III
75	497.10	III
10	514.94	III
50	520.61	III
25	523.79	III
40	529.80	III
15	539.71	III
15	546.12	III
20	708.84	III

K III		
Intensity	Wavelength	
20	765.31	III
30	765.64	III
35	778.53	III
20	872.31	III
10	873.86	III
15	874.04	III
	Air	
6	2550.02	III
5	2635.11	III
1	2736.96	III
5	2689.90	III
1	2898.90	III
5	2938.45	III
1	2948.94	III
5	2986.20	III
6	2992.42	III
6	3052.07	III
5	3056.84	III
6	3201.95	III
6	3209.34	III
6	3278.79	III
6	3289.06	III
6	3322.40	III
6	3364.22	III
6	3420.82	III
4	3421.83	III
6	3468.32	III
6	3481.11	III
5	3513.88	III
1	3885.50	III

K IV		
Refs. 32,76,86,150,160, 314,322 – L.J.R. Vacuum		
150	271.82	IV
100	273.06	IV
	279.88	IV
300	340.46	IV
150	340.74	IV
300	354.93	IV
150	356.26	IV
300	359.73	IV
200	359.91	IV
250	362.08	IV
150	362.15	IV
150	363.02	IV
300	375.96	IV
300	379.88	IV
250	380.48	IV
200	381.70	IV
300	382.23	IV
150	382.49	IV
200	382.65	IV
300	382.91	IV
250	384.10	IV
200	386.61	IV
250	388.92	IV
250	389.07	IV
250	390.42	IV
300	390.57	IV
200	391.46	IV
200	392.47	IV
500	393.14	IV
400	400.21	IV
300	402.91	IV
250	403.97	IV
150	404.41	IV
250	408.08	IV

K IV

Intensity	Wavelength	
150	417.28	IV
200	442.30	IV
300	443.57	IV
200	445.61	IV
250	446.83	IV
750	448.60	IV
400	456.33	IV
250	523.00	IV
200	526.45	IV
150	527.62	IV
750	646.19	IV
500	737.14	IV
500	741.95	IV
500	745.26	IV
400	746.35	IV
300	749.99	IV
150	754.19	IV
400	754.67	IV

K V

Refs. 32,75,76,150,322 - L.J.R. Vacuum

100	214.35	V
150	282.35	V
150	293.33	V
300	294.84	V
200	296.17	V
200	297.06	V
200	300.25	V
200	300.50	V
200	311.24	V
250	312.77	V
200	315.18	V
250	327.38	V
250	389.07	V
200	349.50	V
500	372.15	V
200	372.46	V
200	372.77	V
300	375.96	V
250	377.76	V
300	379.12	V
300	387.80	V
250	390.11	V
250	395.40	V
200	398.36	V
200	398.88	V
200	399.75	V
250	415.05	V
200	415.79	V
400	422.18	V
300	425.16	V
500	425.59	V
250	438.02	V
200	449.71	V
200	452.90	V
250	455.67	V
400	456.33	V
200	482.71	V
200	483.75	V
750	580.32	V
250	585.51	V
500	586.32	V
250	602.27	V
400	603.43	V
250	638.67	V
300	687.50	V
300	720.43	V

K V

Intensity	Wavelength	
400	724.42	V
600	731.86	V
150	770.29	V
150	771.46	V
	1035.60	V

PRASEODYMIUM (Pr)

Z = 59

Pr I and II

Ref. 1 - C.H.C. Air

25	2558.58	II
25	2578.27	I
30	2579.31	I
40 h	2598.04	II
25	2608.92	II
25	2615.75	II
25	2648.48	II
30	2654.75	II
25	2666.70	II
20	2672.52	II
30	2685.19	II
45	2685.70	II
50	2698.92	II
60	2700.38	II
30	2702.25	II
100 h	2707.37	II
20	2714.16	II
60	2720.17	II
30	2721.90	II
50	2726.50	II
12	2731.78	II
25	2733.12	II
50	2734.30	II
25	2737.90	II
40	2742.12	II
25	2744.66	II
20	2746.28	II
60	2760.35	II
50	2769.60	II
50 d	2775.94	II
	2776.03	II
40	2778.80	II
50	2783.31	II
30	2789.05	II
35	2792.51	II
50	2802.05	II
20	2823.17	II
20	2824.14	II
20	2828.29	II
20	2842.98	I
20	2844.01	II
20	2850.62	I
25	2853.99	II
30	2865.64	II
50	2881.60	I
30	2882.31	II
30	2884.89	II
30	2943.97	II
30	2967.58	II
30	2971.13	II
40 d	2971.40	II
	2971.46	II
50	2984.98	II
30	2986.18	II
30	2990.22	II
110	3082.11	II

Pr I and II

Intensity	Wavelength	
100	3111.34	II
140	3121.58	II
140	3163.73	II
270	3168.24	II
160	3172.31	II
110	3191.42	II
200 d	3195.99	II
110	3199.04	II
100	3207.89	II
190	3219.48	II
100	3234.27	II
100	3245.48	II
140	3355.67	II
110	3394.62	II
110	3465.74	II
200	3584.21	II
130	3611.94	II
170	3630.96	II
100	3645.55	II
250	3645.66	II
250	3646.30	II
100	3648.30	II
150 c	3660.36	II
100	3661.62	II
370	3668.83	II
250	3687.03	II
150	3687.19	II
100	3689.71	II
150	3698.06	II
230	3706.75	II
170 c	3711.10	II
290	3714.05	II
120 c	3733.03	II
210 c	3734.41	II
250	3735.76	II
190	3736.49	II
410	3739.18	II
150	3740.99	II
120	3743.98	II
190	3750.98	II
140	3759.60	II
120	3760.08	II
680	3761.87	II
230	3764.77	II
230	3768.94	II
170 c	3772.82	II
170	3774.06	II
140	3777.62	II
170	3780.66	II
150	3785.46	II
150	3786.86	II
210	3792.51	II
190	3794.93	II
680	3800.30	II
290	3804.84	II
140	3809.18	II
390	3811.84	II
1300 h	3816.02	II
120	3817.66	II
680	3818.28	II
120	3819.14	II
310	3821.80	II
150 c	3823.18	II
120	3826.67	II
960	3830.72	II
140	3834.93	II
480	3840.99	II
270	3842.34	II
150 c	3844.54	II

Pr I and II

Intensity	Wavelength	
580	3846.59	II
1200	3850.79	II
720 c	3851.55	II
960	3852.80	II
120	3858.25	II
110	3859.14	II
480 c	3865.45	II
210	3867.52	II
210	3870.72	II
480	3876.19	II
1700 c	3877.18	II
270	3879.20	II
680	3880.47	II
440 c	3885.19	II
440 c	3889.34	II
120 c	3891.71	II
190	3897.25	II
210	3898.84	II
250	3902.45	II
770 c	3908.05	II
630	3912.90	II
310	3913.55	II
210	3914.76	II
1300 c	3918.85	II
420	3919.63	II
250	3920.53	II
960	3925.47	II
480	3927.46	II
370	3929.29	II
370	3935.82	II
250	3938.30	II
730 c	3947.63	II
900 c	3949.43	II
900 c	3953.51	II
380	3956.75	II
190	3959.44	I
470	3962.45	II
560	3964.26	II
1600 c	3964.81	II
560 c	3966.57	II
500	3971.16	II
320	3971.67	II
620 c	3972.14	II
320	3974.85	II
1300 c	3989.68	II
230	3991.91	II
340	3992.16	II
1600	3994.79	II
270	3995.83	II
560 c	3997.04	II
230	3997.96	II
320	3999.12	II
620 c	4000.17	II
730	4004.70	II
1900	4008.69	II
620	4010.60	II
730	4015.39	II
620	4020.96	II
470	4022.71	II
360	4025.54	II
230	4026.83	II
230	4029.00	II
360 c	4029.72	II
730 c	4031.75	II
230	4032.47	II
960	4033.83	II
230	4034.33	II
230	4038.22	II
730	4038.45	II

Pr I and II			Pr I and II			Pr I and II			Pr I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
470	4039.34	II	470 c	4347.49	II	410	5129.52	II	22	5645.41	II
1300	4044.81	II	340	4350.40	II	270	5133.44	I	35	5654.23	II
230	4045.70	II	450	4354.91	II	270	5135.14	II	55	5659.84	II
230	4046.63	II	410 c	4359.79	II	100	5139.81	I	35 h	5661.57	I
340	4047.08	II	1200	4368.33	II	100 c	5152.30	II	16	5662.19	II
450	4051.13	II	320	4371.62	II	200	5161.74	II	65 c	5668.46	I
2200	4054.88	II	270	4396.08	II	620	5173.90	II	45	5669.55	II
2200	4056.54	II	170	4403.60	II	200	5191.32	II	35	5669.99	II
450	4058.80	II	100	4405.12	II	120	5194.43	I	16	5674.14	II
230	4062.22	II	430	4405.83	II	150	5195.11	II	16	5677.03	II
3400	4062.81	II	1700	4408.82	II	200	5195.31	II	55	5681.89	II
210	4068.80	II	410	4413.77	II	360	5206.55	II	13	5685.60	II
500 c	4079.77	II	160	4419.04	II	150	5207.90	II	16	5686.52	I
500 c	4080.98	II	190	4419.65	II	360	5219.05	II	22 h	5687.17	II
790	4081.85	II	160 c	4421.22	II	560	5220.11	II	65	5688.44	II
500	4083.34	II	160	4424.58	II	110	5227.97	I	22	5689.21	II
200 c	4087.21	II	1200 c	4429.13	II	680	5259.73	II	55 h	5690.97	II
560	4096.82	II	110	4432.28	II	180	5263.88	II	22	5695.90	II
380	4098.40	II	730	4449.83	II	340 c	5292.02	II	22	5704.38	I
2900 c	4100.72	II	140	4451.90	II	340	5292.62	II	65	5707.61	I
270 c	4113.89	II	140	4454.68	II	230	5298.09	II	40	5711.63	II
1700 c	4118.46	II	100	4465.97	II	430	5322.76	II	22	5713.83	II
250	4129.15	II	960	4468.66	II	200	5352.40	II	16	5716.08	II
340	4130.77	II	140 c	4477.26	II	16	5501.50	I	45	5719.08	II
200	4133.61	II	1100	4496.46	II	40	5508.79	II	45 d	5719.63	II
1500 c	4141.22	II	790	4510.15	II	65	5509.15	II		5719.80	II
2700	4143.11	II	200 c	4517.58	II	16 c	5511.63	II	11	5728.38	I
270 c	4146.50	II	340 c	4534.15	II	55	5513.58	II	40	5731.88	II
270	4148.44	II	340	4535.92	II	28	5515.12	II	20	5747.13	II
200	4156.50	II	200	4563.12	II	13	5519.38	II	11	5747.74	I
1700 c	4164.16	II	140	4612.08	II	20 c	5520.31	II	11	5747.95	II
270	4168.04	II	270 c	4628.74	II	45 c	5522.79	II	22	5753.02	II
230	4169.45	II	140	4632.28	I	28 c	5524.15	I	90	5756.17	II
620	4171.82	II	140	4635.68	I	28 c	5525.91	II	16	5759.40	II
730	4172.25	II	200	4639.55	I	16 c	5527.93	I	22	5760.20	I
250	4175.32	II	110 c	4643.49	II	13	5530.21	I	22	5769.16	II
250	4175.62	II	140	4646.05	II	45	5531.16	I	16	5769.79	II
200	4178.63	II	200 c	4651.50	II	150	5535.17	II	45	5773.16	II
5200	4179.39	II	140	4664.65	II	28	5538.37	I	11	5775.91	II
2500	4189.48	II	270 c	4672.09	II	20	5538.78	II	16	5777.29	II
560 c	4191.60	II	180	4687.80	I	55	5545.01	II	90	5779.28	I
290	4201.17	II	290	4695.77	I	20	5548.33	II	65 c	5785.28	II
2500 c	4206.72	II	140cw	4708.07	II	11	5553.42	II	65	5786.17	II
500	4208.32	II	140	4709.52	I	22	5561.46	II	16 h	5788.29	II
320	4211.86	II	180	4730.67	I	45 c	5562.06	I	16	5788.92	II
320	4217.81	II	250	4736.69	I	13	5565.52	I	16	5790.86	II
3800	4222.93	II	100	4744.16	I	13	5566.91	II	45	5791.36	II
3800	4225.35	II	150	4746.92	II	45	5571.83	II	22	5792.95	I
320	4233.11	II	100	4762.72	II	11	5574.61	II	40	5810.58	II
320 c	4236.15	II	110	4783.35	II	11	5578.81	I	16	5813.55	II
270	4240.02	II	110	4906.99	I	13	5582.35	II	160 d	5815.17	II
960	4241.01	II	140	4914.02	I	11	5584.02	II		5815.33	II
340	4243.51	II	200	4924.60	I	22	5594.92	I	55	5818.57	II
840 c	4247.63	II	140	4936.00	I	22	5597.29	II	40	5820.62	II
500	4254.40	II	320	4939.74	I	13	5601.30	II	16 h	5821.36	I
270 c	4263.78	II	160	4940.30	I	90	5605.65	II	55	5822.59	II
320	4269.09	II	380	4951.37	I	13	5606.68	I	90	5823.72	II
790 c	4272.27	II	110	4975.75	I	28	5608.93	II	45	5830.94	II
470 c	4280.07	II	120	5018.59	I	55	5610.22	II	40	5835.13	I
790 c	4282.42	II	200	5019.76	I	11	5620.06	II	35 c	5844.65	II
450 c	4298.98	II	200	5026.96	I	20	5620.26	I	40	5844.98	II
290	4303.61	II	100	5033.38	I	45 c	5621.89	II	65	5847.13	II
1500	4305.76	II	270	5034.41	II	110	5623.05	II	65 c	5850.64	II
210	4323.55	II	110	5043.83	I	90	5624.45	II	45	5852.63	II
270	4329.41	II	320	5045.52	I	11 h	5633.03	I	11 c	5854.44	I
1300	4333.97	II	160	5053.40	I	22	5636.46	II	45	5856.07	II
200	4335.74	II	180	5087.12	I	55 c	5638.79	II	55	5856.90	II
360	4338.70	II	360	5110.38	II	16	5640.37	II	90	5859.68	II
620cw	4344.30	II	560	5116.76	II	16cw	5643.16	I	80	5868.83	II

Pr I and II		
Intensity	Wavelength	
22	5873.83	II
35	5874.72	I
35	5878.10	I
35	5879.04	I
80	5879.25	II
35 c	5884.72	I
55	5892.23	II
22	5894.22	II
40	5903.11	II
45	5904.45	II
40	5908.67	II
11	5915.31	I
11	5915.97	I
40	5920.76	I
40	5930.66	II
16	5936.33	II
160	5939.90	II
65	5940.72	II
22	5941.65	I
35	5947.16	II
22 c	5949.76	I
55	5951.27	II
20	5951.76	II
90	5956.60	II
	5956.70	I
13	5959.25	I
20	5962.18	I
28	5963.00	I
110	5967.82	II
13 c	5976.95	I
13	5978.88	I
65	5981.19	II
40	5986.14	I
45 c	5987.14	I
	5987.29	II
13	5991.27	I
13 c	5994.89	I
11	5996.06	I
29	6002.44	II
90	6006.33	II
13	6008.54	I
55	6016.48	II
150	6017.80	II
28 c	6019.85	I
150	6025.72	II
35	6042.87	II
55	6046.66	II
35	6049.26	I
28	6050.04	II
11	6050.88	I
140	6055.13	I
13	6067.27	II
13	6085.81	I
28	6086.16	II
65	6087.52	II
20	6090.38	II
28	6093.09	II
18	6096.28	I
22	6106.72	II
18	6109.08	I
65	6114.38	II
22 c	6118.02	I
22 c	6122.15	I
35	6141.51	II
65	6148.23	I
	6148.24	II
22	6157.82	II
13	6159.10	II
190	6161.18	II

Pr I and II		
Intensity	Wavelength	
18	6165.38	I
270	6165.94	II
55	6182.34	II
13	6187.96	I
35	6197.45	II
35	6200.81	II
13	6205.63	II
13	6210.59	I
22	6212.73	I
18	6218.06	I
20 h	6236.80	I
20 h	6241.05	I
45	6244.35	II
35	6255.10	II
40	6262.55	II
18	6264.54	II
22 c	6274.66	II
	6274.81	II
40	6278.68	II
110	6281.28	II
18 c	6289.02	I
11 c	6298.01	I
11	6302.05	I
35	6302.35	II
16	6304.05	I
35	6305.23	II
11 h	6318.13	II
45 c	6322.36	I
22 h	6343.88	I
28	6347.11	II
18 c	6350.98	I
22 c	6357.20	I
55 c	6359.03	I
11 h	6363.62	II
16	6377.61	I
16	6378.59	I
11	6389.57	I
18 c	6391.99	I
40	6393.18	I
45	6397.96	II
10 h	6410.69	I
55	6411.23	I
40	6413.68	II
10	6415.43	I
45	6429.63	II
45	6431.84	II
7 h	6442.78	II
9 h	6443.91	II
16 c	6453.44	I
9	6454.84	II
9	6456.18	I
9 h	6460.19	I
18	6467.72	II
9 h	6475.26	II
35cw	6478.02	II
45	6486.55	I
9 h	6486.97	II
40 h	6491.75	I
9	6493.49	I
11	6494.89	I
22 c	6497.11	I
18	6498.94	II
22	6500.72	I
9	6504.09	I
8	6517.14	I
16	6518.79	II
8	6534.52	I
16	6540.47	I
7 h	6553.30	I

Pr I and II		
Intensity	Wavelength	
22	6564.62	II
45	6566.77	II
7	6571.03	I
6	6578.00	I
6	6584.56	II
9 h	6593.74	II
11	6595.48	I
15	6609.86	I
55	6616.67	I
11	6618.34	II
7 h	6631.00	I
13 h	6632.06	I
14	6647.12	I
75	6656.83	II
55	6673.41	II
75	6673.78	II
5 h	6687.51	II
4 h	6699.25	I
13	6736.79	I
35 c	6747.09	I
19 c	6749.19	I
7 c	6784.99	II
55cw	6798.60	I
11	6811.76	II
17cw	6812.87	II
13	6814.04	II
9	6817.61	I
35cw	6827.60	II
19	6830.50	II
9	6844.39	I
9 h	6845.47	II
9	6846.59	II
17 c	6850.46	II
11	6852.77	I
11 c	6870.44	I
7	6884.66	I
8	6892.71	I
8 h	6970.38	
8 c	6980.12	I
40	7021.51	II
10	7024.53	I
13	7042.40	I
8	7044.45	II
7	7051.07	I
10	7079.99	I
11 c	7095.18	I
20	7114.55	I
10 h	7116.90	I
11	7118.24	II
7	7137.33	II
10 h	7159.88	I
7	7167.77	II
7 h	7189.95	I
10 c	7208.85	II
24	7227.70	II
13	7231.53	I
7 c	7243.26	I
7 c	7259.21	I
7 c	7287.61	I
7 h	7289.19	I
7cw	7324.42	I
7	7328.47	I
7	7344.86	
16	7407.56	II
20 c	7451.74	II
11 h	7495.59	I
6 h	7499.42	I
14	7541.02	II
6	7574.86	I

Pr I and II		
Intensity	Wavelength	
20	7645.66	II
7	7704.98	II
16	7721.84	I
6 h	7786.16	II
6cw	7841.27	I
14	7871.67	I
6	7881.09	I
6cw	7888.56	II
6	7915.19	II
6	8031.92	I
6	8055.43	I
14	8067.44	I
10cw	8122.78	II
11	8141.10	I
5	8181.34	II
5 c	8211.93	I
6	8289.93	I
6	8379.84	I
6 h	8427.82	I
6 h	8605.27	II
10	8714.59	II

Pr III		
Refs. 306,308 - J.R.		
Vacuum		
25	1008.61	III
50	1021.35	III
25	1026.18	III
100	1029.03	III
50	1038.29	III
50	1042.96	III
25	1043.80	III
25	1044.03	III
25	1046.20	III
150	1047.24	III
100	1049.09	III
50	1052.63	III
25	1061.60	III
25	1066.03	III
25 p	1068.85	III
25	1069.88	III
25	1084.42	III
25	1088.66	III
100	1104.84	III
25	1108.82	III
30	1352.70	III
25	1881.22	III
Air		
,50	2031.46	III
100	2033.30	III
25	2043.12	III
100	2052.30	III
50	2052.87	III
50	2053.85	III
200	2058.59	III
50	2064.08	III
25	2075.08	III
200	2090.75	III
200	2093.49	III
25	2096.85	III
50	2096.94	III
10 w	2148.14	III
10 w	2194.24	III
10 w	2197.25	III
10 w	2205.48	III
10 w	2206.26	III
10 w	2214.45	III
10 w	2215.25	III
10 w	2217.12	III

Pr III			Pr III			Pr III			Pr III		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
10 w	2223.23	III	10 w	2494.20	III	50 s	3353.87	III	270	4728.21	III
10 w	2230.35	III	10 w	2495.37	III	250 s	3354.91	III	300	4747.11	III
10 w	2237.26	III	10 w	2495.51	III	500 l	3357.56	III	300 w	4771.83	III
10	2239.06	III	10	2499.97	III	500 l	3359.41	III	450 w	4775.30	III
10	2239.42	III	20 w	2587.71	III	100 l	3364.52	III	600	4857.39	III
10 w	2242.15	III	40 w	2624.91	III	50	3364.88	III	150	5208.51	III
10 w	2284.62	III	20 w	2644.62	III	50 s	3365.80	III	150	5261.68	III
10	2307.59	III	20 w	2656.88	III	200 s	3367.35	III	1000	5264.44	III
10	2307.77	III	20 w	2667.51	III	500 s	3367.58	III	1500	5284.70	III
10	2308.41	III	70 w	2679.47	III	100 l	3371.92	III	1500	5299.99	III
10	2311.29	III	40 w	2710.30	III	100 s	3377.14	III	1500	5340.02	III
10	2311.44	III	20 w	2718.65	III	50 s	3379.13	III	100	5427.70	III
10	2314.18	III	100 w	2724.03	III	150 s	3380.21	III	100	5581.74	III
10 w	2315.46	III	20 l	2841.94	III	150 s	3381.26	III	150	5646.80	III
10	2318.15	III	70 s	2910.61	III	300 s	3381.84	III	600	5765.27	III
10	2318.36	III	50 s	2911.77	III	100 s	3391.08	III	1500	5844.41	III
10	2318.64	III	100 l	2914.49	III	1000 w	3394.22	III	200	5947.98	III
10	2318.82	III	50 s	2930.19	III	600 d	3396.07	III	7000 w	5956.05	III
10	2318.97	III	70 s	2942.43	III	300 s	3396.62	III	900 w	5998.94	III
10 w	2319.40	III	70 s	2953.58	III	300 l	3397.46	III	1500 w	6053.01	III
10	2320.41	III	90 w	2954.40	III	50 l	3402.97	III	900	6071.09	III
10 w	2328.56	III	90 s	2964.85	III	500 c	3413.21	III	9000 w	6090.02	III
10 w	2336.13	III	150 s	2968.83	III	300 s	3415.15	III	5000	6160.24	III
10	2365.52	III	80 s	2969.41	III	150 s	3420.07	III	1500 w	6161.22	III
10	2368.78	III	150 l	2976.86	III	300 l	3422.22	III	100	6195.05	III
10	2369.08	III	150 s	2977.06	III	50 c	3426.27	III	2000	6195.63	III
10 w	2378.06	III	500 s	2980.54	III	500 l	3427.02	III	200	6310.36	III
10 w	2378.97	III	100 l	2981.65	III	300 l	3436.36	III	100	6361.65	III
10	2395.44	III	150 c	2982.42	III	150 l	3440.62	III	300	6429.26	III
10	2399.70	III	500 s	2985.82	III	50 l	3445.29	III	300	6444.74	III
10 w	2405.56	III	150 s	2997.12	III	70 s	3454.05	III	600	6500.04	III
10	2408.19	III	70 l	2998.79	III	180	3653.58	III	300	6501.49	III
10	2409.80	III	150 l	3000.46	III	60	3817.25	III	200	6578.90	III
10	2412.40	III	150 s	3003.20	III	60 l	3861.80	III	100	6616.46	III
10	2417.69	III	60 l	3006.47	III	150	3980.51	III	600	6706.70	III
10	2418.95	III	150 s	3008.04	III	200	4000.20	III	100	6727.63	III
10	2426.14	III	150 l	3010.61	III	90	4018.36	III	200	6827.96	III
10	2426.85	III	90 s	3014.60	III	180	4029.60	III	100	6854.63	III
10 w	2430.32	III	100 l	3015.13	III	90	4142.46	III	200	6857.30	III
10 w	2434.18	III	90 s	3016.26	III	120	4144.48	III	1000	6866.80	III
10	2434.39	III	70 s	3021.77	III	90	4147.85	III	1000	6899.06	III
10	2435.91	III	70 s	3025.26	III	90	4172.15	III	500	6903.52	III
10	2436.89	III	100 l	3029.38	III	150	4179.77	III	7000	6910.14	III
10	2438.63	III	100 l	3033.31	III	180	4184.18	III	150 w	6934.55	III
10 w	2444.93	III	90 l	3034.25	III	240	4197.01	III	500	6970.96	III
10	2445.49	III	70	3040.02	III	120	4219.45	III	100	6979.83	III
10	2446.77	III	60 c	3040.94	III	180	4231.45	III	5000	7030.39	III
10	2448.16	III	60 l	3041.78	III	180	4275.07	III	100	7075.21	III
10	2452.02	III	100 s	3042.35	III	120	4286.32	III	4500	7076.62	III
10 w	2452.81	III	100 l	3045.81	III	90	4298.27	III	100	7083.99	III
10 w	2452.85	III	70 l	3046.98	III	90	4301.73	III	500	7112.53	III
10	2454.60	III	120 l	3050.30	III	90	4316.34	III	100 w	7165.64	III
10	2454.82	III	70 s	3055.30	III	60	4354.28	III	250	7231.62	III
10 w	2459.77	III	150 l	3058.90	III	90	4379.82	III	100 w	7238.26	III
10 w	2460.72	III	150 l	3066.71	III	90	4381.47	III	250	7240.21	III
10	2462.18	III	70 s	3078.68	III	120	4404.71	III	100 w	7262.32	III
10	2462.90	III	150 l	3080.20	III	120	4421.10	III	150 w	7340.69	III
10	2468.20	III	50 w	3248.39	III	120	4431.85	III	350	7343.70	III
10	2468.97	III	90 s	3280.92	III	150 w	4447.93	III	200	7349.75	III
10 w	2473.42	III	90 l	3292.58	III	180 w	4450.14	III	300 w	7350.61	III
10 w	2478.32	III	90 s	3296.10	III	120 w	4451.00	III	100 w	7355.52	III
10	2479.98	III	100 l	3306.14	III	120	4461.02	III	2000	7426.48	III
10	2481.02	III	60 s	3333.26	III	200	4461.81	III	4000	7429.05	III
10	2483.30	III	90 s	3340.58	III	300 w	4500.31	III	100	7463.96	III
10	2483.99	III	500 s	3341.43	III	450 w	4612.02	III	250	7487.40	III
10 w	2484.60	III	70 s	3341.68	III	600 w	4625.18	III	200	7493.20	III
10 w	2485.16	III	70 s	3345.38	III	120	4654.16	III	100	7511.17	III
10 w	2488.72	III	70 l	3345.44	III	600 w	4713.70	III	500	7529.11	III
10	2491.97	III	50 w	3351.07	III	300 w	4725.55	III	100 w	7549.20	III

Pr III

Intensity	Wavelength	
150 w	7588.64	III
300	7596.41	III
100 w	7625.63	III
100 w	7648.34	III
100 w	7670.65	III
200 w	7674.65	III
500	7742.34	III
250 w	7745.59	III
500	7754.31	III
100 w	7755.48	III
3000	7781.98	III
200 w	7814.74	III
1500 w	7866.14	III
1000	7888.12	III
400	7897.09	III
1000	7914.00	III
100	7923.16	III
1000 w	7972.75	III
250	8001.14	III
3000	8102.90	III
250	8119.54	III
400	8132.23	III
100	8138.34	III
150 w	8235.33	III
250 w	8244.89	III
100	8409.10	III
100 w	8494.99	III
200 w	8567.63	III
5000 w	8602.74	III
500	8691.58	III
500	8771.38	III
1000	8854.05	III
125	8886.17	III
100	8908.70	III
250	9099.98	III
250	9131.90	III
200	9222.32	III
250 w	9265.56	III
125	9320.54	III
250	9334.33	III
175	9377.44	III
175	9388.56	III
175	9549.77	III
100	9579.74	III
150	9802.98	III
175	9806.37	III
500 w	9991.16	III
500	10031.10	III
500	10160.33	III
500	10238.63	III
500	10301.58	III
500	10324.59	III
500	10716.58	III

Pr IV

Refs. 337,338 – J.R.

Vacuum

20	718.23	IV
30	721.34	IV
60	722.41	IV
30	722.58	IV
20	726.04	IV
50	730.37	IV
30	731.77	IV
30	734.86	IV
20	735.04	IV
20	736.19	IV
50	736.32	IV
100	737.17	IV

Pr IV

Intensity	Wavelength	
100	741.45	IV
20	743.15	IV
20	743.89	IV
20	746.14	IV
40	763.16	IV
20	764.00	IV
300	1226.40	IV
2000	1228.59	IV
500	1230.69	IV
400	1238.19	IV
200	1249.35	IV
200	1255.64	IV
200	1261.27	IV
400	1268.32	IV
300	1270.58	IV
1000	1275.10	IV
200	1275.40	IV
1000	1278.65	IV
200	1279.34	IV
1000	1287.44	IV
300	1290.93	IV
1000	1292.30	IV
5000	1293.22	IV
5000	1295.28	IV
400	1296.50	IV
200	1298.26	IV
300	1298.54	IV
200	1304.71	IV
300	1306.86	IV
200	1308.08	IV
200	1310.71	IV
500	1314.96	IV
300	1315.28	IV
300	1316.96	IV
500	1320.10	IV
1000	1320.70	IV
5000	1321.36	IV
500	1322.51	IV
500	1326.38	IV
5000	1333.57	IV
300	1335.96	IV
500	1339.29	IV
1000	1340.74	IV
200	1341.32	IV
300	1344.23	IV
1000	1347.07	IV
1000	1352.81	IV
500	1354.35	IV
5000	1354.66	IV
2000	1360.64	IV
1000	1364.81	IV
2000	1365.77	IV
400	1368.90	IV
5000	1374.41	IV
1000	1382.62	IV
200	1384.23	IV
200	1385.91	IV
300	1394.11	IV
500	1397.11	IV
1000	1399.31	IV
1000	1400.96	IV
400	1410.90	IV
1000	1424.36	IV
500	1426.59	IV
5000	1435.56	IV
200	1459.95	IV
200	1461.76	IV
1000	1474.91	IV
200	1477.32	IV

Pr IV

Intensity	Wavelength	
500	1485.88	IV
500	1503.35	IV
400	1516.86	IV
200	1520.71	IV
2000	1520.98	IV
400	1523.46	IV
500	1553.62	IV
500	1559.49	IV
500	1570.13	IV
200	1572.80	IV
5000	1574.55	IV
5000	1575.10	IV
3000	1578.38	IV
500	1585.10	IV
300	1613.00	IV
400	1613.65	IV
1000	1618.03	IV
2000	1622.30	IV
300	1634.77	IV
400	1676.08	IV
200	1688.49	IV
200	1713.53	IV
500	1732.86	IV
300	1762.86	IV
1000	1766.88	IV
1000	1771.14	IV
500	1841.08	IV
10000	1884.87	IV
400	1951.23	IV
200	1954.61	IV

Air

200	2025.06	IV
1000	2039.15	IV
200	2047.05	IV
200	2050.73	IV
200	2058.48	IV
2000	2083.23	IV
500	2100.42	IV
1000	2154.31	IV
300	2193.37	IV
1000	2205.13	IV
300	2265.70	IV
200 c	2334.46	IV
200 c	2339.08	IV
500 c	2376.09	IV
2000 c	2378.98	IV
1000 c	2379.66	IV
500 c	2427.07	IV
500 c	2428.13	IV
500 c	2438.57	IV
500 c	2455.64	IV
500 c	2705.19	IV
200 c	2708.01	IV
200 c	2753.47	IV
200 c	2767.60	IV

Pr V

Ref. 149 – J.R.

Vacuum

200	843.78	V
7000	865.90	V
5000	869.17	V
80	869.66	V
1000	896.65	V
750	922.29	V
250	1234.07	V
250	1342.78	V
200	1958.09	V
400	1958.20	V

Pr V

Intensity	Wavelength	
	Air	
300	2246.06	V
300	2246.20	V

PROMETHIUM (Pm)

Z = 61

Pm I and II

Refs. 196,260 – C.H.C.

Air

40 w	2502.12	II
40	2608.24	II
150	2632.00	II
70	2638.46	II
100	2671.05	II
50 w	2787.72	II
40	2808.05	II
100 h	2820.10	II
100 w	2840.82	II
150 w	2841.86	II
200 c	2857.46	II
100	3004.59	II
100	3008.85	II
300	3072.41	II
150	3086.02	II
120	3090.19	II
150	3091.86	II
150	3108.11	II
100	3115.36	II
100	3117.22	II
100	3118.76	II
35	3162.23	I
35	3168.82	I
100	3172.77	II
35	3222.04	I
35	3238.55	I
60	3239.62	II
75	3296.63	I
60	3311.76	II
50	3313.38	I
50	3329.22	I
75	3331.57	I
100	3354.45	I
100	3358.14	II
80	3360.21	II
80	3364.44	II
300	3366.03	I
90	3377.68	II
100	3391.28	II
100	3408.06	II
500	3427.40	II
120	3441.15	II
400	3449.80	II
250	3460.25	II
200	3462.91	II
200	3480.61	II
150	3497.13	II
100	3514.85	II
200	3546.81	I
100	3559.43	II
200	3565.31	II
150	3580.10	II
200	3610.76	II
200	3629.84	II
300	3634.20	II
300	3659.39	II
300 r	3669.22	I
200	3674.85	I

Pm I and II			Pm I and II			Pm I and II			Pm I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
200	3678.51	II	300 r	4284.37	I	300 r	4585.49	I	400 r	4838.92	I
300 r	3679.85	I	600	4297.78	II	200	4593.82	I	300	4839.62	I
200	3687.65	II	200	4303.89	II	400 r	4595.82	I	200	4844.01	I
400	3689.79	II	200 r	4305.64	I	800	4597.55	I	350 r	4852.73	I
300	3692.50	II	400	4318.80	I	500 r	4600.25	I	400 r	4860.62	I
300	3697.50	II	250	4325.92	II	400 r	4602.96	I	700 r	4860.74	I
300 r	3697.63	I	200	4332.05	II	400	4604.59	I	300 r	4865.30	I
400	3702.63	II	300	4336.54	II	600 r	4605.66	I	500 r	4865.72	I
800	3711.72	II	200	4337.48	II	500 r	4609.85	I	400 r	4869.80	I
200	3715.75	II	300	4342.12	II	100	4615.87	II	700 r	4872.42	I
200	3721.72	II	200	4347.72	I	600 r	4617.02	I	500 r	4887.02	I
500	3726.01	I	350 r	4363.92	I	200	4618.40	I	700 r	4892.52	I
200	3738.43	I	300 r	4369.64	I	400 r	4618.49	I	400 r	4900.30	I
300	3740.68	I	200	4381.88	II	500 r	4619.75	I	300 r	4904.28	I
300	3742.52	II	400 r	4388.49	I	500	4621.57	I	400 r	4918.28	I
300 r	3742.97	I	200	4388.76	II	500	4623.31	I	600 r	4932.99	I
500	3745.86	II	400 r	4409.42	I	700 r	4623.68	I	700 r	4959.46	I
300	3747.09	II	500 r	4412.47	I	900	4624.41	I	100	4971.40	II
500	3750.09	II	1000	4417.96	II	500 r	4625.29	I	500 r	4997.10	I
200	3761.68	I	400	4432.51	II	400 r	4627.60	I	200 r	5030.80	I
300	3765.75	I	250 r	4435.86	I	200	4630.93	I	300 r	5058.31	I
300	3775.42	I	300 r	4436.55	I	600 r	4633.45	I	100	5067.35	II
300	3780.77	I	300 r	4438.68	I	400 r	4640.96	I	150	5080.52	II
200	3781.43	I	500	4445.41	II	700 r	4643.36	I	150	5089.35	II
400	3795.66	II	600	4446.90	II	700 r	4643.76	I	200	5092.42	I
250	3806.06	II	800	4453.95	II	400	4645.94	I	400 r	5094.83	I
300 r	3809.20	I	200	4459.97	II	600 r	4647.03	I	200	5096.18	I
400	3810.93	I	250 r	4468.16	I	600 r	4650.42	I	150	5097.30	II
200	3819.26	II	200	4471.48	II	500	4650.52	I	400 r	5100.77	I
300	3820.53	II	300	4473.23	II	400 r	4653.41	I	250	5121.47	II
300	3839.52	I	200	4477.46	II	400	4654.50	I	400 r	5127.34	I
200	3842.88	II	350 r	4478.58	I	500 r	4655.05	I	200	5129.75	I
300	3842.98	II	300 r	4481.60	I	300	4659.38	I	400 r	5145.13	I
250	3845.38	II	300 r	4485.05	I	500 r	4660.79	I	500 r	5146.30	I
300	3874.03	I	300 r	4490.50	I	300 r	4663.26	I	400	5153.86	II
800	3877.62	II	250	4492.05	II	600 r	4663.46	I	300	5169.71	II
300 r	3885.79	I	600	4500.15	II	400 r	4665.19	I	500	5171.58	II
250	3890.97	I	350 r	4500.33	I	500 r	4671.23	I	300	5194.05	II
1000	3892.15	II	250	4506.84	I	400	4671.76	I	500	5208.09	II
300	3898.73	I	100	4509.38	II	500 r	4674.42	I	150	5215.96	II
400	3899.78	II	100	4513.56	II	200	4677.46	I	250	5225.12	II
250	3909.50	II	200	4517.31	I	500 r	4677.92	I	500	5236.26	II
1000	3910.26	II	200	4523.32	I	400 r	4678.09	I	300	5236.66	II
1000	3919.10	II	600	4525.20	II	700 r	4682.92	I	400	5246.33	II
800	3936.48	II	250 r	4526.12	I	500 r	4696.80	I	150	5262.42	II
300	3944.21	II	250 r	4526.76	I	200	4699.51	I	500	5270.64	II
300 r	3954.76	I	400 r	4527.70	I	250	4722.06	II	200	5293.92	II
1000	3957.74	II	800	4529.21	II	300	4727.06	I	100	5308.86	II
500	3980.74	II	300	4540.06	I	900 r	4728.36	I	150	5318.58	II
300	3995.05	II	300 r	4541.42	I	400 r	4728.68	I	200	5410.45	II
1000 r	3998.96	II	450 r	4541.75	I	800 r	4734.27	I	200	5424.54	II
500	4009.96	II	500 r	4544.08	I	200 r	4737.99	I	180	5424.79	II
200	4012.72	II	200	4545.17	I	100	4739.08	II	150	5429.04	II
250	4014.20	II	400 r	4549.78	I	200	4739.78	I	100	5467.64	II
200	4019.34	II	300 r	4554.03	I	350 r	4745.13	I	150	5495.45	II
250	4028.20	II	200	4554.63	I	500 r	4757.73	I	100	5516.42	II
200	4045.36	II	500 r	4555.34	I	800 r	4759.00	I	180	5534.96	II
300	4051.54	II	200	4556.06	I	700 r	4762.57	I	200	5537.38	I
600 r	4055.20	II	300	4557.03	I	700 r	4773.46	I	800	5546.08	II
200 r	4056.56	I	300	4559.21	I	900 r	4781.29	I	120	5556.88	II
600	4075.84	II	100	4564.83	II	250	4794.59	I	150	5558.39	II
200 r	4085.31	I	300 r	4568.14	I	200	4795.43	I	200	5561.73	II
500	4086.10	II	200	4570.37	I	700 r	4798.98	I	800	5576.02	II
250	4140.46	II	300 r	4572.15	I	900 r	4801.36	I	200	5641.29	II
200	4185.74	II	400 r	4575.27	I	700 r	4809.54	I	200	5730.81	I
300	4192.92	II	300	4578.28	I	900 r	4811.96	I	200	5768.16	II
200	4194.70	II	200 r	4578.41	I	400 r	4817.12	I	200	5776.99	I
200	4222.15	II	300 r	4579.48	I	400 r	4827.72	I	500	5823.93	II
300 r	4264.32	I	300	4581.14	I	800 r	4837.66	I	300 c	5868.79	II

Pm I and II

Intensity	Wavelength	
200 c	5875.31	II
100 c	5878.76	II
150	5899.76	II
250	5904.71	I
100	5905.90	I
125	5914.96	I
250 c	5927.17	II
150	5939.66	I
400 c	5946.49	II
800	5956.42	I
200	5956.69	I
100 c	5960.08	II
150	5963.00	II
400	5967.89	I
200	5979.73	I
200	5984.82	I
100 c	5987.13	II
400	5997.12	I
200	6027.11	II
300	6030.06	I
400	6031.32	I
500	6043.39	I
150 c	6052.57	II
100 c	6067.00	II
500	6069.06	I
100	6076.40	II
200	6085.41	II
900	6100.21	I
400	6106.40	I
100	6114.90	II
400 h	6151.76	I
100	6159.53	II
400	6163.16	I
100	6184.52	II
200	6208.91	II
500	6229.64	I
400	6237.79	I
100	6263.25	II
400	6272.69	I
400	6286.06	I
500	6308.29	I
100	6314.20	II
700	6323.84	I
500	6390.31	I
100	6429.64	II
500 h	6431.93	I
100	6436.57	II
400	6487.61	I
400	6510.34	I
500	6517.25	I
200	6519.43	II
1000 d	6520.45	I
500	6542.20	I
100 h	6558.48	II
100	6586.39	II
100	6592.29	II
900	6598.15	I
800	6598.66	I
700	6606.37	I
800 w	6625.23	I
100 h	6625.54	II
700	6649.81	I
400	6659.05	II
100	6661.25	II
500	6661.68	I
400	6663.76	I
800 c	6667.51	I
700 h	6677.47	I
200	6680.89	II

Pm I and II

Intensity	Wavelength	
500	6685.55	I
500	6685.68	I
150	6690.09	II
600	6700.33	I
100	6706.27	II
700	6714.67	I
500	6717.26	I
500	6720.71	I
700	6727.50	I
600	6743.71	I
900	6749.91	I
900	6750.48	I
200	6756.45	II
300	6772.29	II
400	6778.78	I
100	6783.09	II
100	6796.87	II
200	6811.68	II
800	6833.30	I
400	6848.37	I
50	6858.58	II

PROTACTINIUM (Pa)

Z = 91

Pa I and II
Ref. 96 - J.G.C.
Air

3000 h	2466.85	
3000 h	2492.85	
3000	2599.16	II
3000	2699.22	II
3000	2822.79	II
3000 l	2832.14	
3000	2870.01	
3000 h	2871.42	II
3000 h	2891.14	II
3000 h	2906.93	
3000 l	3011.10	II
3000 s	3033.59	II
3000 l	3071.24	II
3000 h	3083.19	
3000 l	3093.23	II
3000 l	3126.23	II
3000 l	3146.28	II
3000 l	3170.89	II
3000 l	3171.54	II
3000	3204.16	
3000 l	3240.58	II
3000	3274.46	II
3000 l	3332.69	II
3000 s	3346.66	II
3000 l	3394.49	
3000 l	3452.82	II
3000	3504.97	I
3000 s	3530.65	II
3000	3570.56	I
3000	3571.82	I
3000	3618.07	I
10000	3636.52	I
3000	3702.74	I
3000	3752.67	I
3000	3873.35	I
3000	3931.83	I
3000 s	3952.62	II
10000 l	3957.85	II
3000 s	3970.07	II
3000	3981.82	I

Pa I and II

Intensity	Wavelength	
10000	3982.23	I
3000 l	4012.96	II
3000 s	4018.21	II
3000	4030.16	II
3000 s	4046.93	II
10000 s	4056.20	II
10000 s	4070.40	II
3000	4117.62	
3000 l	4176.18	II
10000 l	4217.23	II
10000 s	4248.08	II
3000 s	4291.34	II
3000	4400.77	
3000	4436.13	
3000 s	4601.43	II
3000	4628.19	
3000	4820.34	
3000 s	4861.49	
3000 l	6035.78	I
3000	6162.56	I
3000	6216.35	
3000 l	6358.61	I
3000	6379.25	I
3000 l	6438.97	I
3000 h	6792.75	I
10000	6945.72	I
3000	6960.09	I
3000 h	6961.78	I
3000 s	6992.73	I
3000	7076.27	I
3000 h	7100.94	I
10000 s	7114.89	I
3000 h	7171.55	I
3000	7227.13	I
3000	7318.79	I
10000 l	7368.25	I
3000 h	7471.89	I
10000 h	7493.15	I
3000 h	7558.26	I
10000 h	7608.20	I
10000	7626.79	I
10000 s	7635.18	I
10000	7669.34	I
3000	7679.20	I
10000 h	7749.19	I
3000	7872.95	I
3000 l	7945.56	I
10000	8039.34	I
10000 h	8099.84	I
10000	8199.04	I
10000	8271.87	I
3000 s	8358.98	I
3000 s	8369.60	I
3000 h	8441.04	I
10000 h	8532.66	I
10000 s	8572.96	I
3000 h	8639.91	I
3000 h	8653.51	I
10000	8735.27	I
3000	10594.38	
3000	10923.32	I
3000	11646.78	
10000	11791.73	I
3000	12279.01	
3000	13234.09	
10000	13522.40	
10000	14344.76	I
3000	18478.61	I

RADIUM (Ra)

Z = 88

Ra I and II
Refs. 253,254 - E.F.W.
Air

Intensity	Wavelength	
8	2369.73	II
8	2460.55	II
10	2475.50	II
8	2586.61	II
10	2643.73	II
20	2708.96	II
10	2795.21	II
30	2813.76	II
10	3033.44	II
5	3101.80	I
100	3649.55	II
200	3814.42	II
8	4194.09	II
8	4244.72	II
100	4340.64	II
20	4436.27	II
30	4533.11	II
8	4641.29	I
100	4682.28	II
8	4699.28	I
100	4825.91	I
10	4856.07	I
10	4859.41	II
10	4927.53	II
10	5097.56	I
10	5205.93	I
10	5283.28	I
10	5320.29	I
10	5399.80	I
20	5400.23	I
20	5406.81	I
8	5482.13	I
10	5501.98	I
10	5553.57	I
20	5555.85	I
10	5616.66	I
50	5660.81	I
20	5813.63	II
30	6200.30	I
10 p	6336.90	I
20	6446.20	I
20	6487.32	I
10	6593.34	II
10	6719.32	II
20	6980.22	I
20	7118.50	I
50	7141.21	I
20	7225.16	I
10	7310.27	I
20	7838.12	I
50	8019.70	II
6	8177.31	I
5	8335.07	I
5	9932.21	I

RADON (Rn)

Z = 86

Rn I
Ref. 251 - E.F.W.
Air

5	3514.60	I
10	3739.89	I

Rn I		
Intensity	Wavelength	
20	3753.65	I
10	3917.20	I
10	3941.72	I
10	3952.36	I
10	4226.06	I
80	4307.76	I
7	4335.78	I
100	4349.60	I
40	4435.05	I
50	4459.25	I
50	4508.48	I
50	4577.72	I
50	4609.38	I
30	4721.76	I
6	5722.58	I
10	6061.92	I
6	6200.75	I
6	6380.45	I
10	6557.49	I
10	6606.43	I
15	6627.23	I
6	6669.60	I
8	6704.28	I
20	6751.81	I
6	6806.79	I
8	6836.95	I
8	6837.57	I
10	6891.16	I
10	6998.90	I
200	7055.42	I
100	7268.11	I
20	7291.00	I
6	7320.98	I
10	7419.04	I
300	7450.00	I
8	7470.89	I
8	7483.13	I
8	7514.13	I
8	7516.92	I
6	7523.93	I
6	7597.55	I
8	7601.28	I
10	7657.48	I
10	7738.43	I
20	7746.64	I
100	7809.82	I
20	8049.00	I
100	8099.51	I
6	8173.84	I
100	8270.96	I
8	8314.51	I
6	8349.74	I
10	8381.05	I
10	8487.48	I
10	8494.89	I
20	8520.95	I
100	8600.07	I
10	8639.76	I
15	8675.83	I
10	8807.75	I
50	9327.02	I
6	9948.57	I
5	10106.13	I

RHENIUM (Re)

Z = 75

Re I and II

Re I and II Ref. 1 – C.H.C.		
Intensity	Wavelength Air	
25000	2003.53	I
16000	2017.87	I
27000	2049.08	I
4200	2074.70	I
3700	2083.92	I
10000	2085.59	I
4700	2092.41	II
9800	2097.12	I
2700	2109.22	I
3400	2139.04	II
1600	2142.74	II
	2142.97	I
3700	2156.67	I
4900	2167.94	I
3400	2176.21	I
4200 c	2214.26	II
2200	2214.58	I
1700	2226.42	I
920	2235.44	I
440	2255.73	I
860	2256.19	I
2000	2264.39	I
2100	2274.62	I
5200 c	2275.25	II
1600	2281.62	I
2900	2287.51	I
2700	2294.49	I
390	2298.09	II
390	2299.77	I
610	2302.99	I
680	2306.54	I
230	2312.97	I
220	2313.34	I
220	2319.19	I
370	2320.16	I
800	2322.49	I
300	2328.66	I
270	2334.33	I
270	2335.73	I
220	2336.10	I
270	2337.95	I
860	2344.78	I
230	2349.39	I
220 d	2350.46	I
680	2352.07	I
210 d	2353.95	I
250	2356.50	I
200	2365.32	I
1200	2365.90	I
570	2367.68	I
180	2368.53	II
520	2369.27	I
220	2370.76	II
210	2371.52	I
150	2373.48	II
320	2375.07	I
75	2378.53	II
370	2379.77	I
180	2386.90	II
340	2388.57	I
230	2393.65	I
320	2394.37	I
320	2396.79	I
200	2397.31	I
210 d	2400.72	I
	2400.89	I
210	2401.68	I

Re I and II		
Intensity	Wavelength	
75	2403.04	II
1500	2405.06	I
740	2405.60	I
320	2406.70	I
270	2410.37	I
60	2418.20	II
1200	2419.81	I
300	2421.73	I
300	2421.88	I
60	2423.84	II
2500	2428.58	I
490	2431.54	I
420	2432.18	I
340 c	2441.47	I
230	2442.51	I
250	2444.94	I
610	2446.98	I
85	2449.03	II
85	2449.52	II
610	2449.71	I
200	2455.83	II
390	2461.20	I
800 c	2461.84	II
200	2467.57	II
120	2467.85	II
150 c	2469.36	II
120	2470.61	II
75	2471.05	II
150	2473.72	II
160	2475.17	II
75	2477.43	II
200	2479.02	I
1200	2483.92	I
390	2485.81	I
980	2487.33	I
75	2490.16	II
200	2492.84	I
370	2496.04	I
200	2498.22	I
370	2501.72	I
570	2502.35	II
230	2504.60	II
270	2505.94	I
1800 c	2508.99	I
570	2520.01	I
540	2521.50	I
150	2534.10	II
370	2534.80	I
570	2540.51	I
740 d	2544.74	I
370	2545.48	I
160	2550.09	II
300	2552.02	I
150 c	2553.59	II
370	2554.63	II
1000	2556.51	I
250	2559.08	I
340	2564.19	I
540	2568.64	II
370	2571.81	II
380	2586.79	I
290	2599.86	I
290	2603.89	I
660	2608.50	II
610 d	2611.54	I
160 c	2616.72	II
200	2622.76	I
310	2635.83	II
550	2636.64	I

Re I and II		
Intensity	Wavelength	
190	2637.01	II
90	2641.02	II
270	2642.75	I
65	2648.46	II
270	2649.05	I
660	2651.90	I
400	2654.12	I
220	2663.63	I
940	2674.34	I
220	2688.53	I
1300	2715.47	I
200	2731.56	II
220	2732.21	I
610	2733.04	II
110 h	2753.64	II
220	2758.00	I
210	2763.79	I
200	2766.39	I
310	2767.74	I
220	2768.85	I
220	2769.32	I
350	2770.42	I
550	2783.57	I
220	2791.29	I
120	2803.28	II
220	2814.68	I
75	2819.78	II
880	2819.95	I
310	2834.08	I
200	2837.55	I
200	2840.35	I
220	2843.00	I
270	2850.98	I
240	2867.19	I
200	2875.28	I
200	2883.44	I
2900	2887.68	I
130 c	2888.06	II
490	2896.01	I
830 c	2902.48	I
210	2905.58	I
550	2909.82	I
65 h	2916.73	II
830 c	2927.42	I
270	2930.61	I
440	2943.14	I
130 h	2957.91	II
270	2962.27	I
720	2965.11	I
1500	2965.76	I
90	2968.98	II
310	2976.29	I
210	2978.15	I
220	2980.82	I
220	2982.19	I
220	2988.47	I
1800	2992.36	I
5500	2999.60	I
350	3001.14	I
220	3004.14	I
200	3006.42	I
500	3016.02	I
300	3016.49	I
380	3030.45	I
240	3047.25	I
200	3058.78	I
1600	3067.40	I
320	3069.94	I
260	3071.16	I

Re I and II			Re I and II			Re I and II			Re I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
200	3072.96	I	400	3449.37	I	140	3936.90	I	20	5333.85	I
550	3082.43	I	16000 c	3451.88	I	110	3944.72	I	35	5369.48	I
340	3088.76	I	240	3453.50	I	180	3945.91	I	50 c	5369.80	I
200	3093.64	I	55000 c	3460.46	I	280	3961.04	I	100 c	5377.10	I
200	3095.06	I	40000 c	3464.73	I	350 c	3962.48	I	25	5431.90	I
700	3100.67	I	400	3467.96	I	100	4004.93	I	14	5437.03	I
140	3103.06	II	240	3476.44	I	140	4022.96	I	14	5447.92	I
700	3108.81	I	400	3480.38	I	100	4023.31	I	25	5460.64	I
340	3110.86	I	320	3480.85	I	110 c	4029.63	I	14 h	5520.05	I
340 c	3118.19	I	240	3482.23	I	220	4033.31	I	25	5521.10	I
340	3121.36	I	560	3503.06	I	110	4037.49	I	50 c	5532.68	I
420	3128.94	I	100 c	3512.28	I	200	4048.99	I	50 c	5563.24	I
260	3134.02	I	320	3516.65	I	240	4081.43	I	25	5573.47	I
250	3141.38	I	320	3517.33	I	140	4104.42	I	25	5584.72	I
440	3151.64	I	120	3534.82	I	240 c	4110.89	I	10 h	5607.21	I
330	3153.79	I	320	3537.46	I	190	4121.64	I	12 h	5612.27	I
360 c	3158.31	I	160	3539.33	I	240cw	4133.42	I	100	5667.88	I
220	3164.52	I	240	3549.89	I	1800	4136.45	I	25	5711.43	I
700	3168.37	I	160	3551.29	I	700	4144.36	I	18	5716.95	I
220	3174.61	I	160	3553.65	I	140	4149.96	I	110 c	5752.93	I
440	3177.71	I	160	3558.94	I	160	4170.40	I	110cw	5776.83	I
260	3178.61	I	160	3568.23	I	220	4182.90	I	18	5791.60	I
600	3182.87	I	240	3570.26	I	220	4183.06	I	10 c	5815.92	I
1100	3184.76	I	360	3579.12	I	650	4221.08	I	550	5834.31	I
1100	3185.57	I	810 c	3580.15	II	3600 c	4227.46	I	10	5919.86	I
260	3190.78	I	650	3580.97	I	150	4241.39	I	60	5943.24	I
260	3192.36	I	810	3583.02	I	260 c	4257.60	I	10	5950.21	I
200	3194.50	I	160	3596.39	I	120 c	4291.17	I	18 h	5969.77	I
220	3198.58	I	160	3610.49	I	200	4304.40	I	10	5989.99	I
1100 c	3204.25	I	320	3617.08	I	200	4332.25	I	18 h	5995.73	I
380	3235.94	I	160	3621.46	I	40	4357.98	II	30	6114.22	I
600	3258.85	I	160	3625.91	I	380	4358.69	I	35 c	6145.81	I
600	3259.55	I	140	3637.06	I	190	4367.58	I	50	6146.82	I
200	3261.56	I	810	3637.84	I	140	4391.34	I	18	6203.24	I
300	3268.89	I	440	3651.97	I	360cw	4394.38	I	25	6217.97	I
200	3294.83	I	120	3669.78	I	110cw	4406.40	I	30cw	6229.42	I
280	3296.70	I	320	3670.53	I	180	4415.82	I	35cw	6243.24	I
280	3296.99	I	860 c	3689.50	I	150	4475.08	I	35 d	6260.02	I
280	3301.60	I	1500 c	3691.48	I	120	4478.39	I		6260.24	I
240	3302.23	I	100	3697.71	I	120 c	4507.04	I	18 c	6271.37	I
320	3303.21	II	520	3703.24	I	2600	4513.31	I	18	6278.76	I
280	3303.75	I	100	3705.02	I	260	4516.64	I	10	6286.41	I
240	3313.95	I	240	3709.93	I	500	4522.73	I	10	6303.42	I
600	3322.48	I	360 c	3717.28	I	120	4523.88	I	200	6307.70	I
200	3331.52	I	4000	3725.76	I	120	4529.95	I	200	6321.90	I
2000	3338.18	I	140	3731.87	I	100	4545.17	I	80 d	6350.75	I
1600	3342.24	I	140	3732.28	I	120	4580.68	I	16 h	6382.94	I
810	3344.32	I	240 c	3735.01	I	120	4605.73	I	14	6411.47	I
320	3346.20	I	810	3735.31	I	100	4621.38	I	50	6511.47	I
240 d	3356.33	I	910	3740.10	I	190 c	4791.42	I	14	6515.25	I
200	3358.02	I	140	3740.41	I	2200cw	4889.14	I	12	6544.91	I
200	3362.74	I	130	3742.26	II	220	4923.90	I	35 c	6577.11	I
240	3377.74	I	300cw	3745.44	I	40	5058.56	I	40cw	6592.52	I
320	3379.06	II	140	3766.48	I	70	5096.50	I	100cw	6605.19	I
320	3379.70	I	120	3768.26	I	20	5120.32	I	30 c	6623.91	I
200	3385.76	I	140	3777.66	I	25	5161.65	I	10 c	6637.25	I
240	3389.43	I	700	3787.52	I	40 c	5178.89	I	27cw	6652.39	I
200	3390.25	I	160	3796.59	I	20	5181.74	I	15 h	6683.28	I
4000	3399.30	I	160	3797.59	I	35	5234.31	I	9 c	6711.30	I
650	3404.72	I	190	3807.74	I	50	5248.86	I	30	6751.22	I
650	3405.89	I	120	3815.66	I	1300	5270.95	I	5 c	6761.19	I
240	3408.67	I	120	3836.30	I	1600cw	5275.56	I	180 c	6813.41	I
320	3409.83	I	240	3869.94	I	100	5278.24	I	260	6829.90	I
320	3417.77	I	240	3875.26	I	30	5305.56	I	85	6971.53	I
810	3419.41	I	240	3876.86	I	20	5317.28	I	35cw	7006.63	I
8000	3424.62	I	100	3908.21	I	35	5321.28	I	65cw	7024.15	I
400	3426.19	I	130	3913.92	I	50	5327.46	I	65cw	7246.67	I
300	3427.61	I	380 c	3917.27	I	20	5331.90	I	13cw	7292.72	I
320	3437.71	I	550	3929.85	I	20	5332.76	I	40cw	7578.73	I

Re I and II		
Intensity	Wavelength	
13	7611.89	I
7cw	7620.25	I
50cw	7640.94	I
65cw	7912.94	I
35cw	7980.77	I
40	8417.13	I
29cw	8527.73	I

RHODIUM (Rh)

Z = 45

Rh I and II Ref. 1 - C.H.C. Air		
150	2276.21	II
140	2288.57	I
110	2309.82	I
55	2318.36	I
95	2319.10	I
95	2321.73	I
350	2322.58	I
140	2326.47	I
80	2328.64	I
190	2334.77	II
55	2345.41	I
55	2352.47	I
55	2359.18	I
300	2361.92	I
110	2368.34	I
270	2382.89	I
230	2383.40	I
40	2384.65	I
270	2386.14	II
80	2407.88	I
27	2408.19	I
27	2410.25	I
80	2415.84	II
55	2418.64	
45	2419.75	I
45	2420.18	II
65	2420.98	II
75	2423.94	
65	2427.11	II
130	2427.68	I
230	2429.52	I
40	2431.85	II
40	2432.66	I
18	2437.08	I
110	2437.90	I
330	2440.34	I
50 h	2444.27	I
65	2448.84	I
50	2449.04	I
75	2450.56	I
30	2455.70	II
65	2458.90	II
90	2461.04	II
30	2463.61	I
75	2470.39	I
90	2471.47	I
30	2472.51	I
130	2473.09	I
15	2475.64	II
15	2477.54	II
25	2482.04	I
50	2483.33	I
150	2487.47	I
100	2490.77	II

Rh I and II		
Intensity	Wavelength	
30	2492.30	I
75 h	2494.51	
15	2499.02	I
40	2500.58	
130	2502.46	I
15	2503.84	II
300	2504.29	II
40	2505.10	II
150	2505.67	I
350	2509.70	I
50	2510.66	II
300	2511.03	II
75	2513.36	II
200	2515.75	I
130	2520.53	II
13	2525.99	I
13	2531.74	I
50	2532.66	
13	2533.59	
50	2534.07	
110	2536.71	
110	2537.04	II
30	2539.72	
40	2544.22	
350	2545.70	I
13	2548.60	
550	2555.36	I
25	2558.62	I
50	2565.79	I
45	2566.04	I
25	2566.92	II
50	2567.28	
25	2574.66	
25	2575.75	I
13	2576.23	
40	2587.29	II
30	2598.07	
30	2603.32	II
75	2606.44	II
75	2613.60	
150	2622.58	I
230	2625.88	I
100	2630.42	I
40	2634.99	I
30	2638.74	II
75	2643.00	I
110	2647.28	I
400	2652.66	I
30	2659.01	I
30	2671.06	I
65	2676.11	I
25	2680.28	I
100	2680.63	I
30	2681.78	I
30 h	2686.50	
30 h	2686.91	
50	2694.31	I
400	2703.73	I
40	2705.63	II
40	2707.23	I
75	2714.41	I
100	2715.31	II
75	2717.51	I
180	2718.54	I
65	2720.14	I
30	2720.52	I
160	2728.94	I
40	2736.76	I
75	2741.75	I

Rh I and II		
Intensity	Wavelength	
50	2767.73	I
100	2771.51	I
50	2778.06	I
75	2779.54	I
130	2783.03	I
25	2791.16	I
75	2796.63	I
150	2826.43	I
180	2826.68	I
30	2827.31	I
75	2834.12	I
45	2835.44	I
75	2836.69	I
50	2856.16	I
50 d	2860.68	I
	2860.76	I
280	2862.94	I
65	2864.40	I
50	2871.35	I
30	2873.62	I
110	2878.66	I
75	2880.76	I
140	2882.37	I
75	2885.97	I
75	2889.11	I
75	2889.84	I
65	2899.96	I
25	2904.81	I
160	2907.21	I
65	2910.17	II
75	2912.62	I
90	2915.42	I
30	2923.10	I
180	2924.02	I
130	2929.11	I
130	2931.94	I
30	2955.41	I
230	2968.66	I
25	2974.03	I
160	2977.68	I
450	2986.20	I
90	2986.99	I
50	2987.45	I
110	3004.46	I
50	3019.54	I
130	3023.91	I
50	3028.43	I
30	3045.77	I
30	3046.76	I
25	3057.89	I
65	3067.30	I
180	3083.96	I
29	3087.42	I
70	3114.91	I
140	3121.76	I
240	3123.70	I
35	3130.79	I
95	3137.71	I
45	3151.36	I
45	3152.60	I
130	3155.78	I
70	3179.73	I
80	3185.59	I
140	3189.05	I
470	3191.19	I
190	3197.13	I
70	3214.32	I
80	3237.66	I
520	3263.14	I

Rh I and II		
Intensity	Wavelength	
520	3271.61	I
2300	3280.55	I
110	3281.70	I
2300	3283.57	I
280	3289.14	I
45	3289.64	I
210	3294.28	I
45	3296.72	I
260	3300.46	I
4200	3323.09	I
60	3331.09	I
45	3331.24	I
330	3338.54	I
70	3342.90	I
80	3344.20	I
60	3359.90	I
280	3360.80	I
60	3362.18	I
420	3368.38	I
45	3369.68	I
1100	3372.25	I
110	3377.14	I
80	3377.71	I
110	3385.78	I
5600	3396.82	I
820	3399.70	I
160	3406.55	I
820	3412.27	I
60	3420.16	I
330	3421.22	I
120 d	3424.38	I
8200	3434.89	I
1400	3440.53	I
35	3442.63	I
120	3447.74	I
60	3448.58	I
120	3450.29	I
60	3451.15	I
400	3455.22	I
60	3455.42	I
180	3457.07	I
220	3457.93	I
5900	3462.04	I
180	3469.62	I
4700	3470.66	I
120	3472.25	I
4700	3474.78	I
2100	3478.91	I
95	3484.04	I
80	3491.07	I
110	3494.44	I
1200	3498.73	I
5900	3502.52	I
60	3505.41	I
2800	3507.32	I
60	3511.78	I
60	3513.10	I
60	3519.54	I
8800	3528.02	I
880 d	3538.14	I
	3538.26	I
280	3541.91	I
1200	3543.95	I
1800	3549.54	I
240	3564.13	I
1200	3570.18	I
4700	3583.10	I
120	3583.53	I
4700	3596.19	I

Rh I and II			Rh I and II			Rh I and II			Rh I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
5900	3597.15	I	380	3975.31	I	35	5184.19	I	9	6627.80	I
310	3605.86	I	240	3984.40	I	95	5193.14	I	19	6630.16	I
3100	3612.47	I	240	3995.61	I	16	5206.95	I	40	6752.35	I
240	3614.78	I	380	3996.15	I	16	5211.52	I	9	6796.65	I
200	3620.46	I	120	4023.14	I	19	5212.73	I	13	6827.33	I
1800	3626.59	I	60	4048.41	I	16	5214.79	I	11	6857.68	I
95	3627.80	I	23	4049.04	I	19	5222.66	I	20	6879.94	I
310	3639.51	I	40	4053.44	I	19	5230.62	I	65	6965.67	I
350	3654.87	I	23	4056.34	I	45	5237.16	I	8	6972.91	I
8200	3657.99	I	70	4077.57	I	9	5237.80	I	16	6979.15	I
280	3661.86	I	560	4082.78	I	14	5269.27	I	16	7001.58	I
1300	3666.22	I	19	4084.28	I	11 h	5280.12	I	11	7038.76	I
180	3666.91	I	45	4087.79	I	14	5292.14	I	18	7101.64	I
140	3674.76	I	60	4088.50	I	14	5314.79	I	15	7104.45	I
560	3681.04	I	140	4097.52	I	40 h	5329.74	I	6	7142.55	I
1900	3690.70	I	45	4107.49	I	14 h	5331.08	I	9	7219.06	I
9400	3692.36	I	70	4116.33	I	9	5349.31	I	18	7268.18	I
60	3694.95	I	120	4119.68	I	130	5354.40	I	35	7270.82	I
940	3695.52	I	1100	4121.68	I	23	5356.47	I	12	7271.94	I
280	3698.26	I	1500	4128.87	I	45	5379.10	I	5	7273.03	I
380	3698.60	I	2100	4135.27	I	95	5390.44	I	9	7375.57	I
7600	3700.91	I	240	4154.37	I	23 h	5404.73	I	5 h	7386.64	I
940	3713.02	I	330	4196.50	I	60 h	5424.07	I	9	7430.80	I
60	3713.43	I	70	4206.62	I	19	5424.72	I	18 h	7442.39	I
45	3714.83	I	3300	4211.14	I	19 h	5425.45	I	7	7446.77	I
16	3724.94	I	29	4230.20	I	12	5439.58	I	12	7475.74	I
650	3735.28	I	40	4244.44	I	12 h	5441.36	I	12	7495.24	I
420	3737.27	I	60	4273.43	I	9 h	5444.32	I	8	7542.02	I
420	3744.17	I	60	4278.60	I	35 h	5445.23	I	11	7557.67	I
1200	3748.22	I	820	4288.71	I	23 h	5468.11	I	8	7577.22	I
240	3754.12	I	70	4296.77	I	35 h	5470.85	I	11	7690.05	I
380	3754.27	I	23	4342.44	I	12	5476.12	I	18	7772.90	I
490	3755.58	I	45	4373.04	I	12	5481.42	I	29	7791.61	I
1000	3760.40	I	4200	4374.80	I	16	5484.23	I	55	7824.91	I
2300	3765.08	I	95	4379.92	I	9	5504.65	I	15	7830.05	I
490	3769.97	I	23	4433.32	I	29	5535.04	I	15	7846.50	I
70	3775.72	I	35	4492.47	I	21 l	5544.58	I	21	8029.91	I
380	3778.13	I	29	4503.78	I	160	5599.42	I	11 h	8036.09	I
1000	3788.47	I	23	4528.72	I	7	5607.71	I	29	8045.36	I
1300	3792.18	I	16	4544.27	I	16	5608.35	I	7	8063.50	I
3800	3793.22	I	35	4548.73	I	5	5632.77	I	15	8136.20	I
4900	3799.31	I	40	4551.64	I	9	5659.62	I	7 h	8193.67	I
760	3805.92	I	19	4560.89	I	40	5686.38	I	5 h	8369.67	I
1300	3806.76	I	16	4565.19	I	9 h	5702.47	I	8	8425.59	I
45	3809.50	I	130	4569.00	I	6	5727.30	I			
95	3812.45	I	14	4571.31	I	29	5792.66	I			
470	3815.01	I	29	4608.12	I	9	5795.79	I			
760	3816.47	I	14	4619.91	I	9	5803.34	I			
1300	3818.19	I	23	4643.18	I	40	5806.91	I			
3800	3822.26	I	150	4675.03	I	6	5821.84	I			
2300	3828.48	I	19	4721.00	I	35	5831.58	I			
2000	3833.89	I	70	4745.11	I	7	5907.31	I			
45	3834.75	I	12	4755.58	I	9	5918.54	I			
5900	3856.52	I	23	4810.49	I	7	5941.46	I			
490	3870.01	I	21	4842.43	I	130	5983.60	I			
70	3872.39	I	45	4843.99	I	9	5991.19	I			
380	3877.34	I	60	4851.63	I	35	6102.72	I			
70	3888.34	I	60	4963.71	I	6	6116.15	I			
29	3904.22	I	60	4977.75	I	8	6128.06	I			
23	3912.83	I	40	4979.18	I	8	6186.89	I			
120	3913.51	I	14	5085.52	I	14	6199.99	I			
240	3922.19	I	70	5090.63	I	16	6253.72	I			
2000	3934.23	I	23	5120.69	I	5	6276.66	I			
45	3934.98	I	19	5130.76	I	8	6277.46	I			
50	3935.84	I	60	5155.54	I	6	6293.38	I			
590	3942.72	I	14	5157.09	I	29	6319.53	I			
95	3958.24	I	40	5158.69	I	12	6414.72	I			
3800	3958.86	I	60	5175.97	I	16	6510.41	I			
45	3964.54	II	12	5177.27	I	19	6519.70	I			

Rh III

Ref. 396 – L.J.R.

Vacuum		
10	746.28	III
30	759.54	III
50	813.44	III
30	826.01	III
30	843.63	III
30	849.08	III
40	852.70	III
40	854.77	III
40	859.89	III
40	861.34	III
50	863.78	III
50	865.22	III
50	870.40	III
80	882.51	III
100	925.75	III
150	937.28	III
100	976.12	III
500	991.62	III
400	992.48	III
500 d	1009.60	III
200	1012.22	III

Rh III		
Intensity	Wavelength	
200	1015.17	III
100	1050.00	III
100	1058.97	III
200	1073.87	III
100	1100.58	III
100	1113.79	III
100	1768.43	III
150	1784.24	III
200	1784.94	III
150	1796.50	III
200	1816.03	III
1000	1832.05	III
500	1859.85	III
100	1874.70	III
800	1880.66	III
500	1884.91	III
500	1887.36	III
700	1888.62	III
800	1901.32	III
500	1910.16	III
600	1919.37	III
500	1927.07	III
700	1931.79	III
500	1954.25	III
400	1965.16	III
500	1994.26	III
	Air	
400	2005.14	III
800	2013.71	III
500	2017.47	III
500	2028.53	III
800	2036.72	III
600	2037.61	III
1000	2040.18	III
3000	2048.67	III
2000	2064.11	III
800	2076.84	III
1000	2118.53	III
1000	2118.63	III
1000	2139.44	III
1000	2152.23	III
3000	2158.17	III
3000	2163.19	III
3000	2167.33	III
100	2207.00	III
100	2230.66	III
50	2250.84	III
30	2374.84	III
20	2470.65	III
50	3006.43	III
50	3052.44	III
50	3310.69	III
1	3852.98	III

RUBIDIUM (Rb)

Z = 37

Rb I and II

Refs. 12,130,241,257,264 - J.R. Vacuum

Intensity	Wavelength	
10	474.88	II
40	481.118	II
90	497.430	II
20	508.434	II
150	513.266	II
300	530.173	II
75	533.801	II

Rb I and II		
Intensity	Wavelength	
40	542.887	II
200	555.036	II
2500	589.419	II
1500	643.878	II
3000	697.049	II
6000	711.187	II
10000	741.456	II
1000	1604.12	II
200	1644.96	II
200	1707.52	II
600	1716.85	II
5000	1760.50	II
200	1803.47	II
500	1809.68	II
500	1865.33	II
500	1889.42	II
500	1954.24	II
300	1956.54	II
200	1971.42	II
500	1983.19	II
	Air	
300	2042.23	II
300	2052.21	II
500	2052.80	II
2000	2068.92	II
1000	2071.50	II
10000	2075.95	II
1000	2090.29	II
200	2108.06	II
300	2116.50	II
1000	2125.25	II
400	2129.82	II
200	2143.10	II
30000	2143.83	II
200	2190.36	II
600	2197.99	II
600	2198.26	II
300	2207.86	II
10000	2217.08	II
200	2223.79	II
400	2237.72	II
500	2250.65	II
200	2251.43	II
800	2254.19	II
200	2254.55	II
200	2263.54	II
500	2263.94	II
500	2286.82	II
5000	2291.71	II
300	2298.80	II
250	2333.01	II
2000	2333.39	II
350	2353.11	II
300	2353.96	II
400	2356.97	II
300	2358.04	II
300	2364.27	II
200	2364.32	II
200	2365.15	II
300	2367.51	II
200	2373.21	II
2000	2385.34	II
250	2405.94	II
400	2434.17	II
800	2459.14	II
50000	2472.20	II
300	2484.56	II
700	2484.70	II
2000	2496.38	II

Rb I and II		
Intensity	Wavelength	
200	2502.67	II
250	2514.18	II
1000	2524.24	II
200	2594.56	II
400	2623.76	II
400	2645.58	II
1000	2684.10	II
1000	2711.76	II
250	2741.01	II
500	2812.15	II
350	2838.51	II
750	2873.88	II
1000	3051.36	II
2	3082.02	I
250	3088.58	II
10	3112.57	I
3	3113.06	I
5000 c	3148.90	II
25	3157.54	I
5	3158.26	I
1200	3161.00	II
50	3227.98	I
6	3229.16	I
2000	3270.99	II
1500	3321.49	II
1200	3340.55	II
60	3348.72	I
75	3350.82	I
750	3353.89	II
1200	3393.03	II
750	3415.58	II
1000	3434.18	II
1500	3461.50	II
3000	3521.39	II
3000 l	3531.55	II
1000	3541.15	II
100	3587.05	I
40	3591.57	I
5000	3600.60	II
10000	3600.64	II
600 c	3639.80	II
400 c	3646.26	II
350 c	3647.56	II
1000 c	3662.74	II
900 c	3663.81	II
350	3666.72	II
300	3675.66	II
2500 c	3699.58	II
350	3746.33	II
3500	3796.81	II
2500	3801.90	II
1000	3826.66	II
450	3860.74	II
250	3907.29	II
500	3922.20	II
2500 l	3926.44	II
25000	3940.51	II
1000 c	3978.15	II
1700	4029.49	II
2500 c	4083.88	II
2000 c	4104.28	II
1700 c	4136.11	II
3500	4193.08	II
1000	4201.80	I
500	4215.53	I
90000	4244.40	II
500	4266.58	II
250 c	4270.25	II
15000	4273.14	II

Rb I and II		
Intensity	Wavelength	
2500 c	4287.97	II
1500	4293.97	II
500 c	4306.26	II
1000	4346.96	II
2500	4377.12	II
300	4440.10	II
1000	4469.47	II
400 c	4493.92	II
700	4519.04	II
3000	4530.34	II
500 l	4533.79	II
400	4540.74	II
20000	4571.77	II
3000 c	4622.42	II
350 c	4631.89	II
10000	4648.57	II
500	4659.28	II
1000	4730.45	II
1000	4755.30	II
400 c	4757.82	II
30000	4775.95	II
5000 c	4782.83	II
300 c	4855.34	II
1500 c	4885.59	II
2	5087.987	I
2	5132.471	I
10	5150.134	I
10000	5152.08	II
300	5164.58	II
1	5165.023	I
2	5165.142	I
1	5169.65	I
15	5195.278	I
2	5233.968	I
20	5260.034	I
1	5260.228	I
200	5270.51	II
3	5322.380	I
40	5362.601	I
4	5390.568	I
75	5431.532	I
3	5431.830	I
500	5512.55	II
5000	5522.78	II
6	5578.788	I
5000 c	5635.99	II
40	5647.774	I
20	5653.750	I
3000 d	5699.15	II
60	5724.121	I
3	5724.614	I
200	5739.64	II
75	6070.755	I
200	6135.27	II
30 c	6159.626	I
1000 c	6199.08	II
75 c	6206.309	I
300	6269.40	II
120 c	6298.325	I
5	6299.224	I
10000	6458.33	II
1000	6555.62	II
5000	6560.81	II
3000 l	6775.07	II
100 l	7279.997	I
300 c	7316.52	II
150	7408.173	I
200 l	7618.933	I
300	7757.651	I

Rb I and II

Intensity	Wavelength	
60	7759.436	I
90000 c	7800.27	I
5 l	7925.26	I
4	7925.54	I
45000 c	7947.60	I
40 l	8271.41	I
30	8271.71	I
2000	8603.96	II
40 l	8868.512	I
30	8868.852	I
300	8978.88	II
300	9021.77	II
3	9224.64	I
2	9234.25	I
500 c	9246.41	II
300	9338.87	II
200 w	9373.50	II
300	9391.36	II
1000	9479.32	II
700 l	9493.72	II
30 l	9522.65	I
5	9523.05	I
20 l	9540.18	I
300	9612.99	II
300	9671.54	II
2000 c	9689.05	II
200	9776.06	II
200	9934.76	II
35 l	10075.282	I
30 l	10075.708	I
100	13235.17	I
20	13442.81	I
30	13443.57	I
75	13665.01	I
1000	14752.41	I
800	15288.43	I
150	15289.48	I
20	22529.65	I
10	22932.47	I
4	27314.31	I
2	27905.37	I

Rb III

Refs. 258,262 - J.R.

Vacuum

30	465.85	III
35 p	482.43	III
30 p	482.47	III
500	482.83	III
300	484.84	III
500	489.66	III
100	489.96	III
600	493.48	III
50	497.82	III
100	500.28	III
30	508.33	III
400	516.79	III
800	533.64	III
1200	535.86	III
1200	556.19	III
500	558.36	III
700	564.77	III
1500	566.71	III
1000	572.82	III
1500	576.65	III
2500	579.63	III
1500	581.26	III
500	582.34	III
800	586.77	III

Rb III

Intensity	Wavelength	
100	591.42	III
900	593.65	III
1000	594.94	III
1300	595.88	III
1200	598.49	III
450	602.09	III
50	605.51	III
500	607.28	III
400	613.31	III
500	619.67	III
20	620.83	III
100	622.24	III
250	630.06	III
500	645.67	III
20	674.81	III
5000	769.04	III
2500	815.28	III

Air

100	2153.21	III
250	2164.59	III
100	2268.00	III
150	2300.12	III
500	2304.14	III
150	2304.45	III
250	2312.46	III
200	2337.07	III
100	2341.90	III
200	2345.37	III
100	2349.81	III
150	2380.44	III
100	2381.29	III
150	2418.46	III
300	2561.86	III
100	2573.71	III
100	2577.07	III
200	2586.83	III
1000	2631.75	III
350	2636.83	III
100	2656.68	III
100	2713.86	III
500	2798.86	III
150	2800.27	III
500	2807.58	III
100	2845.44	III
150	2869.77	III
500	2903.69	III
150	2949.62	III
100	2951.01	III
2000	2956.07	III
500 l	2967.45	III
150	2968.13	III
500	2970.74	III
250	2987.40	III
350	3023.61	III
200	3039.62	III
200	3041.48	III
250	3070.70	III
500	3086.84	III
100	3098.49	III
500	3111.36	III
250 s	3114.82	III
120	3118.92	III
100	3169.34	III
200	3222.60	III
500	3286.41	III
100	3330.16	III
200	3346.92	III
250	3439.26	III
100	3492.68	III

Rb IV

Ref. 109 - J.R.

Vacuum

Intensity	Wavelength	
10	595.18	IV
25	663.76	IV
25	716.24	IV
20	733.41	IV
50	740.85	IV
20	749.86	IV
20	753.75	IV
10	771.54	IV
25	776.89	IV
9	817.92	IV
15	850.18	IV
10	988.00	IV

RUTHENIUM (Ru)

Z = 44

Ru I and II

Ref. 1 - C.H.C.

Air

2400	2076.43	I
2600	2083.77	I
2400	2090.89	I
690	2255.52	I
290	2259.53	I
780	2272.09	I
240	2278.19	I
780	2279.57	I
170	2285.38	I
290	2302.54	I
480	2317.80	I
150	2322.01	I
120	2334.96	II
240	2340.69	I
190 h	2342.85	II
190	2349.34	I
310	2351.33	I
170	2357.91	II
140	2360.56	I
170	2370.17	I
240	2375.27	I
80	2375.63	II
160	2392.42	I
95	2396.71	II
780	2402.72	II
150	2407.92	II
55	2410.89	I
55	2414.82	II
130	2420.82	I
55	2422.92	I
45	2429.60	I
65	2432.93	I
30	2447.45	I
30	2450.58	I
65	2454.92	I
180	2455.53	II
150	2456.44	II
370	2456.57	II
65 h	2458.62	I
55	2462.94	I
85	2464.70	I
30	2474.04	I
110	2475.41	I
100	2476.88	I
280	2478.93	II
28	2481.11	II

Ru I and II

Intensity	Wavelength	
30	2489.91	I
18	2491.78	I
65	2493.69	II
85	2494.02	I
45	2494.48	II
85	2495.69	II
65	2496.56	I
140	2498.42	II
140	2498.57	II
85	2499.78	I
260	2507.01	II
130	2508.27	I
110	2509.07	I
110	2512.81	I
110	2513.32	II
110	2517.32	II
150	2535.59	II
65	2543.25	II
280	2544.22	I
120	2546.67	I
280	2549.48	I
550	2549.58	I
130	2560.26	I
120	2560.83	I
110	2563.15	I
160	2568.77	I
100	2570.97	I
100	2578.57	I
100	2579.53	I
100	2589.57	I
170	2591.12	I
120	2592.02	I
100	2593.70	I
110	2594.85	I
370	2609.06	I
830	2612.07	I
100	2615.09	I
220	2631.30	I
220	2635.86	I
170	2636.67	I
110	2640.33	I
460	2642.96	I
110	2647.32	I
110	2651.29	I
330	2651.84	I
28	2656.25	II
400	2659.62	I
23	2661.17	II
330	2661.61	II
200	2664.76	I
30	2667.40	II
690	2678.76	II
220	2686.29	I
28	2687.50	II
	2688.16	II
330	2692.06	II
110	2701.34	I
110	2702.83	I
170	2709.20	I
200	2712.41	II
690	2719.52	I
130	2722.65	I
140	2725.47	II
310	2734.35	II
1800	2735.72	I
170	2739.22	I
130	2744.45	I
35	2747.97	II
75	2752.45	II

Ru I and II			Ru I and II			Ru I and II			Ru I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
75	2752.77	II	60	3177.05	II	200	3640.64	I	870	3984.86	I
260	2763.42	I	180	3186.04	I	290	3650.32	I	280	3995.98	I
35	2765.44	II	240	3188.34	I	310	3654.40	I	1500	4022.16	I
90	2768.93	II	240	3189.98	I	6200	3661.35	I	600	4023.83	I
100	2778.38	II	180	3196.59	I	830	3663.37	I	310	4039.21	I
110	2787.83	II	180	3223.27	I	650	3669.49	I	1400	4051.40	I
140	2802.81	I	110	3226.37	I	240	3678.32	I	710	4054.05	I
35	2806.74	II	100	3227.88	I	260	3696.59	I	370	4064.46	I
350	2810.03	I	220	3228.53	I	410	3717.00	I	200	4067.61	I
1700	2810.55	I	220	3238.53	I	260	3719.33	I	760	4068.37	I
350	2818.36	I	120	3241.24	I	550	3726.10	I	200	4073.00	I
110	2822.03	I	120	3243.50	I	8700	3726.93	I	980	4076 73	I
200	2827.87	I	280	3260.35	I	11000	3728.03	I	6000	4080.60	I
400	2829.16	I	120 d	3264.55	I	7100	3730.43	I	310	4085.43	I
130	2834.00	I	120	3266.44	I	280	3737.40	I	930	4097.79	I
150	2840.54	I	200	3268.21	I	410	3739.46	I	350	4101.74	I
35	2841.68	II	200	3273.08	I	3500	3742.28	I	1900	4112.74	I
640	2854.07	I	200	3274.71	I	870	3742.78	I	2000	4144.16	I
180	2860.02	I	100	3277.57	I	280	3744.22	I	650	4145.74	I
420	2861.41	I	490	3294.11	I	410	3744.40	I	260	4146.77	I
550	2866.64	I	370	3301.59	I	2800	3745.59	I	870	4167.51	I
110	2868.31	I	220	3306.17	I	760	3753.54	I	550	4197.58	I
1800	2874.98	I	290	3315.23	I	310	3755.09	I	550	4198.88	I
220	2879.76	I	290	3316.39	I	870	3755.93	I	7600	4199.90	I
55	2882.12	II	100	3325.00	I	1200	3759.84	I	1500	4206.02	I
130	2883.60	I	120	3335.69	I	370	3760.03	I	5400	4212.06	I
740	2886.54	I	930	3339.55	I	600	3761.51	I	760	4214.44	I
180	2892.56	I	240	3341.66	I	600	3767.35	I	930	4217.27	I
110	2901.94	I	200	3361.15	I	1500	3777.59	I	370	4220.68	I
140	2905.65	I	370	3368.45	I	460	3781.18	I	550	4230.31	I
370	2908.88	I	100	3371.86	I	600	3782.74	I	760	4241.05	I
1100	2916.26	I	130	3374.65	I	3900	3786.06	I	760	4243.06	I
150	2919.61	I	120	3378.02	I	6000	3790.51	I	370	4246.73	I
35	2927.54	II	100	3379.60	I	240	3794.92	I	310	4258.99	I
180	2945.67	II	130	3380.18	I	760	3798.05	I	760	4284.33	I
180	2946.99	I	130	3385.14	I	7600	3798.90	I	220	4293.28	I
370	2949.50	I	130	3388.71	I	7600	3799.35	I	260	4294.79	I
150	2954.49	I	100	3389.50	I	310	3800.26	I	550	4295.93	I
18	2963.40	II	370	3392.54	I	310	3808.68	I	3700	4297.71	I
550	2965.16	I	310	3401.74	I	600	3812.72	I	930	4307.60	I
170	2965.55	II	310	3409.28	I	760	3817.27	I	370	4318.43	I
140	2976.59	II	3100	3417.35	I	760	3819.03	I	550	4319.87	I
550	2976.92	I	4900	3428.31	I	650	3822.09	I	550	4342.07	I
45	2977.23	II	490	3430.77	I	550	3824.93	I	350	4349.70	I
75	2979.96	II	310	3432.74	I	760	3831.80	I	710	4354.13	I
1400	2988.95	I	6400	3436.74	I	220	3835.05	I	870	4361.21	I
35	2991.62	II	260	3438.37	I	310	3838.07	I	2400	4372.21	I
110	2993.27	I	220	3440.20	I	930	3839.70	I	870	4385.39	I
460	2994.96	I	260	3473.75	I	480	3846.68	I	1300	4385.65	I
440	3006.59	I	240	3481.30	I	760	3850.43	I	1700	4390.44	I
330	3017.24	I	8300	3498.94	I	480	3856.46	I	1600	4410.03	I
310	3020.88	I	640	3514.49	I	1300	3857.55	I	160	4421.46	I
240	3033.45	I	330	3519.64	I	220	3860.72	I	330	4428.46	I
200	3040.31	I	200	3528.68	I	650	3862.69	I	460	4439.76	I
220	3042.48	I	240	3532.81	I	1300	3867.84	I	440	4449.34	I
110	3045.71	I	390	3537.95	I	260	3873.52	I	1100	4460.04	I
110	3048.78	I	790	3539.37	I	650	3892.21	I	190	4473.93	I
150	3054.94	I	200	3541.63	I	760	3909.08	I	150	4480.45	I
390	3064.84	I	690	3570.59	I	260	3920.92	I	350	4498.14	I
170	3089.14	I	200	3574.58	I	1500	3923.47	I	120	4510.10	I
120	3089.80	I	390	3587.20	I	3300	3925.92	I	220	4516.89	I
330	3096.57	I	6400	3589.22	I	600	3931.76	I	220	4517.82	I
120	3097.60	I	6900	3593.02	I	310	3933.55	I	110	4520.95	I
830	3099.28	I	6400	3596.18	I	760	3945.57	I	170	4547.33	I
740	3100.84	I	1300	3599.76	I	460	3950.21	I	110	4547.85	I
120	3125.96	I	350	3625.20	I	310	3952.68	I	5400	4554.51	I
120	3153.82	I	370	3626.74	I	460	3964.90	I	110	4559.98	I
290	3159.92	I	3100	3634.93	I	600	3978.44	I	1700	4584.44	I
200	3168.52	I	210	3637.47	I	600	3979.42	I	110	4591.10	I

Ru I and II			Ru I and II			Ru I and II			Ru III		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
150	4592.52	I	65	5385.88	I	26 h	6444.84	I	200	850.30	III
330	4599.08	I	110 h	5401.04	I	8	6496.44	I	50	851.22	III
170	4635.69	I	40	5401.39	I	11	6528.74	I	50	852.49	III
200	4645.09	I	40	5418.86	I	4	6560.45	I	150	856.32	III
720	4647.61	I	55	5427.59	I	4	6593.74	I	50	867.48	III
290	4654.32	I	26 l	5439.21	I	9	6618.20	I	250	919.74	III
290	4681.79	I	13	5452.71	I	21	6663.14	I	50	921.78	III
190	4684.02	I	80 h	5454.82	I	55	6690.00	I	250	928.08	III
290	4690.11	I	90	5456.13	I	11	6707.52	I	150	937.16	III
1400	4709.48	I	13 h	5475.18	I	15	6718.30	I	500	940.09	III
140	4731.33	I	55	5479.40	I	15	6730.45	I	250	940.68	III
120	4733.52	I	26	5480.30	I	7	6756.54	I	50	941.85	III
500	4757.84	I	80	5484.32	I	21	6766.95	I	50	942.63	III
260	4815.52	I	18	5484.64	I	30	6775.02	I	50	943.06	III
120	4844.56	I	26	5496.69	I	13	6787.23	I	150	945.68	III
550	4869.15	I	13	5501.02	I	8	6813.51	I	100	946.05	III
160	4895.60	I	130	5510.71	I	15	6823.88	I	100	947.14	III
470	4903.05	I	20	5512.37	I	21	6824.17	I	100	949.83	III
120	4907.89	I	8	5517.86	I	7	6831.52	I	50	950.35	III
260	4921.07	I	12	5521.78	I	26	6911.48	I	100	950.45	III
180	4938.43	I	12	5530.99	I	110	6923.23	I	50	952.59	III
160	4968.90	I	24	5540.66	I	26	6982.01	I	50	957.06	III
160	4980.35	I	12	5556.52	I	26	7027.98	I	50	957.18	III
120	4992.74	I	90	5559.75	I	9	7086.06	I	50	961.58	III
160	5011.23	I	11	5569.03	I	12	7087.35	I	250	961.68	III
90	5014.95	I	21	5578.40	I	4	7141.72	I	100	962.56	III
90	5026.18	I	21	5603.14	I	6	7219.26	I	500	966.54	III
65	5028.16	I	8	5603.55	I	35	7238.92	I	250	967.09	III
35	5040.35	I	13	5606.73	I	7	7266.96	I	150	967.85	III
35	5040.74	I	11	5629.79	I	8	7323.56	I	150	967.92	III
65	5047.31	I	290	5636.24	I	16	7393.93	I	150	971.83	III
450	5057.33	I	11	5641.66	I	18	7468.91	I	250	972.40	III
21	5062.64	I	7	5649.56	I	12	7475.40	I	100	973.54	III
90	5072.97	I	7	5653.30	I	26	7485.79	I	150	973.78	III
120	5076.32	I	11	5665.20	I	70	7499.75	I	750	974.14	III
200	5093.83	I	16	5679.63	I	7	7532.07	I	250	974.46	III
80	5107.07	I	180	5699.05	I	26	7559.61	I	250	977.51	III
24	5123.73	I	13	5724.82	I	5	7612.94	I	100	978.18	III
55	5127.26	I	13	5725.73	I	18	7621.50	I	900	979.43	III
65	5133.89	I	16	5745.99	I	18	7722.87	I	500	981.35	III
530	5136.55	I	16	5747.47	I	5	7729.91	I	250	983.81	III
170	5142.76	I	11	5752.02	I	22	7791.86	I	250	983.91	III
250	5147.24	I	11	5756.83	I	4	7797.89	I	250	985.55	III
110	5151.07	I	11	5767.92	I	4	7806.82	I	900	986.84	III
55	5153.20	I	16	5804.39	I	3	7813.43	I	200	987.87	III
500	5155.14	I	65	5814.98	I	4	7829.81	I	250	991.67	III
55	5160.00	I	8	5828.06	I	5 h	7833.39	I	250	992.75	III
920	5171.03	I	16 h	5833.21	I	6 h	7841.90	I	900	994.56	III
180	5195.02	I	55	5919.34	I	30	7847.80	I	250	995.30	III
80	5199.87	I	80	5921.45	I	80	7881.49	I	200	1000.78	III
45	5202.12	I	21	5926.87	I	16	7890.37	I	300	1001.65	III
45	5213.43	I	26	5932.38	I	16	7924.43	I	250	1004.29	III
65	5223.55	I	8	5936.65	I	5	7948.15	I	500	1009.13	III
40	5242.38	I	8	5951.15	I	9	7967.84	I	900	1009.87	III
55	5251.67	I	21 h	5973.38	I	9	8112.47	I	500	1014.68	III
40	5257.07	I	8	5974.17	I	18	8264.96	I	100	1018.72	III
40	5266.47	I	16	5988.67	I	11	8348.98	I	100	1019.33	III
40	5266.83	I	35	5993.65	I	6	8352.94	I	100	1020.77	III
40	5280.82	I	18	6116.77	I	4	8435.77	I	200	1080.00	III
130	5284.08	I	26	6199.42	I	11	8473.64	I	100	1184.37	III
40	5291.16	I	26	6225.20	I	11	8483.56	I	800	1190.51	III
80	5304.86	I	9	6284.49	I	22	8710.84	I	500	1200.07	III
260	5309.27	I	18	6295.22	I	14	8724.98	I	100	1204.57	III
13	5315.33	I	13	6330.62	I	9	8777.36	I	200	1204.88	III
40	5332.93	I	9	6336.12	I				500	1207.17	III
45 h	5334.70	I	9 h	6363.41	I		Ru III		500	1209.77	III
110	5335.93	I	9	6376.45	I		Ref. 423 – C.H.C.		300	1211.31	III
130	5361.77	I	16	6390.23	I		Vacuum		200	1232.57	III
65	5377.84	I	8	6417.57	I	250	850.09	III	100 h	1653.77	III

Ru III		
ntensity	Wavelength	
200	1699.84	III
100 h	1715.97	III
200	1759.49	III
200 h	1880.95	III
100 h	1883.56	III
200 h	1899.04	III
100 h	1899.42	III
100	1908.31	III
500	1941.35	III
100	1981.82	III
100	1982.10	III
200	1989.22	III
200	1993.32	III
100	1997.55	III
Air		
200	2005.71	III
100	2006.46	III
500	2009.28	III
100	2011.17	III
50	2011.56	III
50	2011.66	III
100	2015.20	III
50	2018.58	III
100	2044.59	III

SAMARIUM (Sm)

Z = 62

Sm I and II		
Ref. 1 - C.H.C.		
Air		
45	2610.07	
90	2640.27	
35	2649.17	
45	2657.68	
70	2662.42	
120	2675.15	
100	2688.60	
45	2690.90	II
130	2693.34	
45	2693.74	
60	2696.08	
85	2707.96	
50	2732.42	
35	2739.87	
29	2762.28	
35	2764.18	
85	2767.85	II
60	2774.77	
85	2776.11	
85	2779.23	II
85	2786.64	
150	2789.38	II
130 h	2796.70	
85	2807.36	
150	2809.50	
120	2810.86	II
85	2817.20	II
29	2820.96	II
220	2830.94	
60	2840.30	
60	2847.49	II
60	2851.35	
120	2866.09	II
70	2868.40	II
70	2881.34	
85	2881.68	
60	2883.09	

Sm I and II		
Intensity	Wavelength	
45	2889.06	
60	2891.34	
85 d	2907.88	
	2907.99	II
130	2910.28	II
85	2937.48	II
70	2943.49	II
150	2953.19	II
85	2962.74	II
160	2969.02	II
100	2983.43	II
60	2991.57	II
100	3021.01	
150	3034.84	II
100	3039.13	II
120	3046.93	II
150	3067.54	
120	3071.29	II
100	3086.45	II
120	3096.88	II
100 h	3102.30	II
250	3106.52	II
220	3110.20	II
200	3117.72	II
270	3136.30	II
150	3139.97	II
150	3147.19	II
180	3152.10	II
410	3152.52	II
150	3162.30	II
360	3169.88	II
180	3178.12	II
720	3183.92	II
310	3187.01	II
430	3187.22	II
360	3187.79	II
360	3193.01	II
360	3196.18	II
150	3201.80	II
150	3204.90	II
360	3207.18	II
180	3208.17	II
600	3211.73	II
150	3214.12	II
270	3215.26	II
530	3216.85	II
600	3218.61	II
150	3219.43	II
270	3226.84	II
180	3228.50	II
270	3228.78	II
720	3230.56	II
360	3231.53	II
150	3231.95	II
430	3233.68	II
720	3236.64	II
150	3237.89	II
720	3239.66	II
530	3241.16	II
180	3241.59	II
180	3242.04	II
150	3244.69	II
240	3249.75	II
720	3250.37	II
360	3253.40	II
270	3253.94	II
850	3254.38	II
110	3255.63	II
360	3262.28	II

Sm I and II		
Intensity	Wavelength	
430	3264.94	II
180	3270.49	II
180	3270.68	II
430 d	3272.48	II
	3272.60	II
430	3272.81	II
430	3273.48	II
430	3276.75	II
270	3280.84	II
180	3285.66	II
430	3286.23	II
720 d	3290.28	II
	3290.39	II
180	3290.65	II
240	3293.37	II
360	3295.44	II
430	3295.81	II
720	3298.10	II
170	3300.98	II
340	3301.68	II
340	3304.52	II
340	3305.18	II
1700	3306.39	II
170	3306.61	II
850	3307.02	II
340	3309.52	II
850	3310.66	II
600	3312.42	II
410	3316.58	II
430	3320.16	II
110	3320.59	II
1200	3321.18	II
340	3323.77	II
340	3325.26	II
170	3325.48	II
340	3327.88	II
170	3333.64	II
170	3336.12	II
850	3340.58	II
240	3343.49	II
110	3343.64	II
240	3344.35	II
170	3347.30	II
240	3348.68	II
220	3350.88	II
410 d	3354.18	II
	3354.30	II
170	3354.72	II
1200	3365.86	II
150	3367.27	II
340	3368.57	II
340	3369.46	II
170	3370.59	II
340	3371.21	II
150	3376.48	II
1200	3382.40	II
510	3384.66	II
150	3384.86	
150	3387.66	II
410	3389.32	II
150	3391.11	II
410	3396.19	II
150	3397.76	II
150	3399.84	II
600	3402.46	II
210	3403.09	II
850	3408.68	II
270	3418.15	II
430	3418.51	II

Sm I and II		
Intensity	Wavelength	
170	3419.77	II
120	3424.78	II
170	3426.20	II
170	3433.68	II
150	3437.10	II
170	3438.06	II
240	3440.50	II
170	3453.56	II
170	3459.20	II
120	3459.42	II
240	3461.13	II
120	3464.07	II
170	3467.87	II
130	3473.96	II
130	3479.53	II
130	3480.26	II
170	3480.56	II
170	3487.41	II
170	3493.61	II
220	3499.84	II
340	3511.23	II
310	3530.60	II
220	3532.57	II
270	3535.65	II
240	3554.15	II
510	3559.10	II
220	3566.84	II
4200	3568.27	II
270	3577.79	II
390	3580.94	II
310	3583.39	II
4200	3592.60	II
340	3601.69	II
1700	3604.28	II
3400	3609.49	II
240	3620.58	II
1700	3621.23	II
240	3623.32	II
850	3627.01	II
850	3631.13	II
3400	3634.29	II
240	3634.93	II
410	3638.77	II
360	3645.29	II
300	3645.39	II
660	3649.53	II
340	3650.19	II
340	3656.22	II
2200	3661.36	II
220	3662.69	II
340	3667.93	II
340	3670.66	II
2200	3670.84	II
340	3677.79	II
270	3681.73	II
270	3688.42	II
270	3692.22	II
1100	3693.99	II
480	3706.75	II
480	3706.98	II
480	3708.41	II
930	3708.65	II
480	3711.54	II
350	3712.76	II
930	3718.88	II
930	3721.85	II
420	3724.90	II
1600	3728.47	II
2100	3731.26	II

Sm I and II			Sm I and II			Sm I and II			Sm I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
1600	3735.98	II	450	3881.38	II	410	4113.90	II	500	4368.03	II
800	3737.14	II	450	3881.79	II	1900	4118.55	II	210	4369.92	II
320	3737.48	II	320	3882.50	II	410	4121.36	II	440	4373.46	II
2900	3739.12	II	3700	3885.29	II	280	4122.51	II	320	4374.98	II
	3739.20	II	660	3889.16	II	710	4123.96	II	880	4378.24	II
800	3741.29	II		3889.22	II	280	4129.23	II	530	4380.42	I
1200	3743.87	II	610	3890.08	II	250	4135.14	II	290	4384.29	II
930	3745.46	I	320	3891.21	II	320	4147.71	II	1600	4390.86	II
	3745.60	II	400	3894.05	II	810	4149.83	II	210	4393.35	I
480	3747.62	II	1600	3896.98	II	1200	4152.21	II	290	4397.34	I
800	3755.28	II	1300	3903.42	II	530	4153.33	II	410	4401.17	I
800	3756.41	I	620	3917.44	II	560	4155.22	II	810 d	4403.06	II
1200	3757.53	II	2500	3922.40	II	810	4169.48	II		4403.13	I
450	3758.45	II	1900	3928.28	II	410	4171.57	II	410	4403.36	II
660	3758.97	II	470	3935.76	II	440	4178.02	II	520	4409.33	II
350	3760.04	II	1300	3941.87	II	530	4181.10	II	290	4411.58	I
1900	3760.69	II	620	3943.24	II	210	4183.33	I	380	4417.58	II
660	3762.59	II	500	3946.51	II	530	4183.76	II	470	4419.33	I
1100	3764.37	II	740	3948.11	II	1000	4188.13	II	1500	4420.53	II
480	3767.36	II	470	3951.89	I	410	4191.93	II	960	4421.14	II
480	3767.76	II	370	3959.53	II	270	4199.45	II	2900	4424.34	II
370 d	3773.33	I	1500	3963.00	II	650	4202.92	II	470	4429.66	I
	3773.42	II	620	3966.04	II	1100	4203.05	II	1600	4433.88	II
1100	3778.14	II	470	3967.68	II	660	4206.13	II	1800	4434.32	II
660	3780.76	II	740	3970.53	II	270	4206.62	II	530	4441.81	I
420	3780.93	II	1500	3971.40	II	660	4210.35	II	440	4442.28	I
320	3787.20	II	620	3974.66	I	740	4220.66	II	710	4444.26	II
1500	3788.12	II	960	3976.27	II	1000	4225.33	II	710	4445.15	I
1600	3793.97	II	1000	3976.43	II	740	4229.70	II	1300	4452.73	II
420	3797.28	II	960	3979.20	II	620	4234.57	II	250	4452.95	I
1600	3797.73	II	740	3983.14	II	1200	4236.74	II	1200	4454.63	II
500	3799.54	II	740	3986.68	II	500	4237.66	II	1000	4458.52	II
800	3800.89	II	370	3987.43	II	620	4244.70	II	250	4459.29	I
320	3805.63	II	1500	3990.00	II	210	4249.55	II	2200	4467.34	II
420	3808.46	II		3990.02	I	250	4251.78	II	810	4470.89	I
320	3809.75	II	740	3993.31	II	2100	4256.39	II	470	4472.43	II
320	3809.88	II	280	4003.46	II	210	4258.58	II	620	4473.02	II
420	3810.43	II	470	4007.48	II	1300	4262.68	II	740	4478.66	II
500	3812.07	II	280	4019.98	II	500	4265.08	II	370	4499.11	I
480	3813.63	II	880	4023.23	II	1200	4279.68	II	370	4499.48	II
420	3814.63	II	740	4035.11	II		4279.75	II	240	4503.38	I
930 d	3820.82		590	4041.68	II	240	4279.94	II	180	4505.05	II
530	3824.18	II	740	4042.72	II	2200	4280.79	II	120	4511.33	I
1600	3826.20	II	880	4042.90	II	710	4282.21	I	560	4511.83	II
530	3830.29	II	240	4044.11	II	470	4282.83	I	440	4515.09	II
1100	3831.50	II	560	4045.05	II	240	4283.50	I	880	4519.63	II
530	3833.83	II	440	4046.16	II	350	4286.64	II	440	4523.04	II
560	3834.48	I	740	4047.16	II	350	4292.18	II		4523.18	I
560	3834.60	II	210	4048.62	II	1600	4296.74	I	650	4523.91	II
370	3835.72	II	590	4049.81	II	320	4304.94	II	290	4533.80	I
500	3838.94	II	440	4058.87	II	880	4309.01	II	270	4536.51	II
400	3840.45	II	560	4063.54	II	240	4312.85	I	710	4537.95	II
1600	3843.50	II	280	4064.32	II	1900	4318.94	II	150	4538.53	II
530	3847.51	II	1400	4064.58	II	470	4319.53	I	290	4540.19	II
640	3848.78	II	810	4066.74	II	590	4323.28	II	380	4542.06	II
420	3851.88	II	710	4068.33	II	240	4324.46	I	810	4543.95	II
530	3853.30	I	810	4075.84	II	1800	4329.02	II	100	4544.83	II
2700	3854.21	II	280	4076.65	II	440	4330.02	I	410	4552.66	II
480	3854.56	I	240	4080.56	II	1300	4334.15	II	270	4554.45	II
800	3855.90	II	410	4082.60	II	880	4336.14	I	240	4560.43	II
480	3857.91	II	280	4083.58	II	560	4345.86	II	470	4566.21	II
400	3858.74	I	220	4084.40	II	1100	4347.80	II	590	4577.69	II
660	3862.05	II	1000	4092.27	II	560	4350.46	II	290	4581.58	I
350	3862.23	II	290	4094.05	II	560	4352.10	II	440	4581.73	I
320	3865.24	II	240	4104.13	II	560	4360.72	II	560	4584.83	II
800	3871.78	II	810	4107.28	II	220	4361.07	II	290	4591.82	II
400	3875.19	II		4107.39	II	810	4362.04	II	380	4593.54	II
560	3875.54	II	410	4109.40	II	440	4362.91	I	560	4595.29	II
800	3880.77	II	280	4110.19	II	220	4363.45	II	240	4596.74	I

Sm I and II			Sm I and II			Sm I and II			Sm I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
220	4604.18	II	260	5103.09	II	50	6291.82	II	26	7281.47	II
290	4606.51	II	140	5104.48	II	35	6307.06	II	8	7282.21	I
290	4615.44	II	140	5116.70	II	70	6327.47	II	19	7283.33	II
470	4615.69	II	510	5117.16	I	45	6426.64	II	16	7288.92	II
150	4630.21	II	350	5122.14	I	45	6472.34	II	13	7290.23	I
880	4642.24	II	360	5155.03	II	35	6484.52	II	26 h	7300.72	II
290	4645.40	I	250	5172.74	I	35	6498.67	II	13	7327.08	II
290	4646.68	II	470	5175.42	I	50	6542.76	II	13	7332.65	I
240	4648.16	II	250	5200.59	I	140	6569.31	II	8	7338.04	I
380	4649.49	I	260	5251.92	I	35 h	6570.67	II	26	7347.30	I
150	4655.13	II	400	5271.40	I	40 h	6585.21	II	26	7376.69	II
290	4663.56	I	250	5282.91	I	110	6589.72	II	13	7393.98	II
740	4669.40	II	190	5320.60	I	40	6601.83	II	30	7444.56	I
620	4669.65	II	110	5341.29	I	95	6604.56	II	26	7445.41	I
470 d	4670.75	I	140	5368.36	I	40 h	6632.28	II	26 d	7453.03	II
	4670.83	I	130	5405.23	I	50	6671.51	I	13	7470.76	I
1100	4674.60	II	220	5453.00	I	70	6679.21	II	26	7481.99	II
680	4676.91	II	140	5466.72	I	70	6693.55	II	23 h	7502.39	II
210	4681.55	I	230	5493.72	I	40 d	6723.07	I	10 h	7517.00	II
370	4687.18	II	80	5512.10	I	120 d	6731.84	II	23 h	7541.42	II
370	4688.73	I	230	5516.09	I	70 d	6734.06	II	9	7544.74	I
130	4693.63	II	50	5548.95	I	40 d	6734.81	II	10	7546.57	I
120	4699.34	II	140	5550.40	I	55	6741.47	II	12 h	7560.03	II
530	4704.40	II	45	5573.42	I	40 h	6778.61	II	19	7562.94	II
270	4713.06	II	35	5588.20	I	60	6790.00	II	23	7570.95	II
130	4715.26	II	50	5600.86	II	95	6794.20	II	23	7572.29	II
730	4716.10	I	50	5621.79	I	55	6844.71	II	19	7578.09	II
270	4717.07	I	70	5626.01	I	75	6856.03	II	30	7585.85	II
210	4717.72	II	85	5644.10	I	120	6860.93	I	23	7588.31	II
190	4718.33	II	140	5659.86	I	40	6862.82	II	10	7598.01	I
270	4719.84	II	120	5696.73	I	30	6950.51	II	23 d	7607.48	II
130	4726.02	II	85	5706.20	I	120	6955.29	II		7607.74	I
770	4728.42	I	35	5710.93	I	90	7020.44	II	12	7613.94	II
470	4745.68	II	50	5732.95	I	13	7036.73	II	10 h	7631.77	II
150	4750.72	I	50	5743.35	II	90	7039.22	II	23	7637.94	II
730	4760.27	I	45	5759.52	II	90	7042.24	II	45	7645.09	II
110	4770.20	I	70	5773.77	I	13	7049.15	II	12	7645.82	I
110	4774.15	II	60	5778.33	I	90	7051.52	II	19	7648.02	II
190	4777.85	II	45	5779.24	I	16	7054.97	II	10	7655.78	II
580	4783.10	I	45	5781.93	II	19	7074.67	I	19	7667.20	II
350	4785.86	I	70 d	5786.98	II	90	7082.37	II	8	7672.49	II
160	4789.96	I	60	5788.38	I	40 d	7085.52	II	10 h	7678.79	II
230	4791.58	II	60	5800.52	I	26	7088.30	I	10 h	7695.78	I
430	4815.81	II	65	5802.84	I	16	7091.16	I	23	7712.04	II
130	4829.57	II	45	5814.89	I	30	7095.50	I	30	7728.56	II
970	4841.70	I	45	5831.02	II	16	7096.33	I	30	7736.26	II
310	4844.21	II	45	5836.37	II	30	7104.54	I	30	7749.30	II
140	4847.76	II	35	5860.78	I	19	7106.23	I	23	7755.20	II
270	4848.32	I	65	5867.79	I	26	7115.96	I	10	7794.50	I
120	4854.36	II	45	5868.61	I	23	7117.51	II	10	7801.54	I
210	4883.77	I	35	5871.06	I	26 h	7119.81	II	8 h	7812.75	II
730	4883.97	I	50	5874.21	I	12	7122.40	II	16	7820.15	II
170	4904.97	I	45	5897.39	II	23 h	7125.11	II	10	7831.40	II
630	4910.40	I	50	5898.96	I	13	7131.80	I	40 w	7835.08	II
350	4913.25	II	35	5938.90	II	10	7136.01	I	26	7837.27	II
430	4918.99	I	65	5965.71	II	12	7139.39	II	10	7844.82	II
110	4924.04	I	35 h	5968.82	II	40 d	7143.98	II	6	7859.53	I
120	4938.10	II	35	5984.29	I	85 d	7149.60	II	19	7863.65	II
170	4948.63	II	50	6045.00	I	10	7172.67	I	10 h	7880.01	II
120	4952.37	II	45	6045.39	I	10	7189.57	II	16	7895.96	I
170	4961.94	II	50	6070.06	I	9	7210.95	I	26	7914.96	II
170	4975.98	I	45	6084.12	I	23	7213.82	I	90	7928.14	II
140	5028.44	II	35 h	6091.40	I	26 d	7218.09	II	9	7931.92	I
400	5044.28	I	45	6110.66	II	13	7220.07	I	19	7937.09	II
200	5052.76	II	45 h	6159.56	I	13	7237.02	II	16	7948.12	II
170	5069.46	II	45	6246.76	II	60	7240.90	II	19 w	8001.61	II
540	5071.20	I	45	6256.54	I	9	7257.11	II	19 w	8014.92	II
170	5100.22	II	45	6256.66	II	9 d	7261.52	II	23	8025.12	II
	5100.39	I	100	6267.28	II	13	7279.25	I	23 w	8026.32	II

Sm I and II

Intensity	Wavelength	
16	8032.03	II
40	8048.70	II
16	8065.16	I
45	8068.46	II
9 w	8117.16	II
9	8125.12	II
26	8161.82	II
19 w	8195.50	II
6	8206.30	II
26 w	8218.76	II
9	8230.33	I
16	8240.98	II
19 w	8289.26	II
10	8300.88	II
40 w	8305.79	II
10	8315.45	I
19 w	8348.68	II
19	8383.71	I
19	8387.77	II
30 w	8432.64	II
19 w	8473.54	II
45 w	8485.99	II
30 w	8510.90	II
23	8543.22	II
23 w	8617.03	II
23 w	8632.82	II
12 w	8677.81	II
13	8706.32	II
45 w	8708.43	II
30 w	8717.89	II
30 w	8758.28	II
16 w	8780.59	II
23 w	8788.83	II
26	8859.76	II
95	8913.66	II

SCANDIUM (Sc)

Z = 21

Sc I and II

Refs. 1,88 - C.H.C. Air

65	2429.16	I
110	2438.62	I
560	2545.22	II
2900	2552.37	II
560	2555.82	II
2300	2560.25	II
1100	2563.21	II
40	2611.22	II
19	2684.23	II
120	2692.78	I
360	2706.77	I
210	2707.95	I
580	2711.35	I
30	2819.54	II
35	2822.15	II
60	2826.68	II
340	2965.86	I
1200	2974.01	I
1400	2980.75	I
340	2988.95	I
2200	3015.36	I
2700	3019.34	I
360	3030.76	I
30	3039.93	II
70	3045.72	II
85	3052.93	II

Sc I and II

Intensity	Wavelength	
120 h	3056.31	I
130	3065.11	II
45	3139.75	II
990	3251.32	II
1500	3255.69	I
4400	3269.91	I
5500	3273.63	I
110 d	3343.28	II
270	3352.05	II
9900	3353.73	II
65 d	3357.30	II
2000	3359.68	II
1700	3361.27	II
1700	3361.94	II
4000	3368.95	II
6600	3372.15	II
90	3416.68	I
130	3418.51	I
65	3419.36	I
200	3429.21	I
200	3429.48	I
270	3431.36	I
530	3435.56	I
90	3439.41	I
65	3440.18	I
65	3448.49	I
270	3457.45	I
180	3462.19	I
130 d	3469.65	I
110	3471.13	I
200	3498.91	I
2700	3535.73	II
6600	3558.55	II
6100	3567.70	II
13000	3572.53	II
9900	3576.35	II
7700	3580.94	II
4000	3589.64	II
4000	3590.48	II
28000	3613.84	II
110	3617.43	I
20000	3630.75	II
13000	3642.79	II
6600	3645.31	II
110	3646.90	I
5300	3651.80	II
110	3664.25	II
290	3666.54	II
55	3675.26	II
40	3678.35	II
75 h	3717.10	I
270	3833.07	II
610	3843.03	II
90	3894.97	I
20000	3907.49	I
23000	3911.81	I
45	3923.51	II
4400	3933.38	I
45	3952.27	I
45	3989.06	II
5500	3996.61	I
530	4014.49	II
20000	4020.40	I
20000	4023.69	I
220	4030.67	I
140	4031.39	I
100	4034.23	I
220	4043.80	I
200	4046.48	I

Sc I and II

Intensity	Wavelength	
2700	4047.79	I
120	4049.95	I
5500	4054.55	I
220	4056.59	I
160 h	4074.97	I
160	4078.57	I
6100	4082.40	I
200	4086.67	I
400	4087.16	I
40 h	4093.13	I
65	4094.85	I
55 h	4098.35	I
65	4100.33	I
440 h	4133.00	I
530 h	4140.30	I
65 h	4147.40	I
720	4152.36	I
55 h	4154.72	
90hd	4161.88	I
1100 h	4165.19	I
65 h	4171.56	I
45 h	4186.45	I
65 h	4187.62	I
75	4205.20	I
65	4212.34	I
45	4212.49	I
75 h	4216.10	I
110 h	4218.26	I
110 h	4219.73	I
40	4221.88	I
90 d	4225.59	I
180	4231.93	I
200	4233.61	I
100	4237.82	I
400	4238.05	I
90	4239.57	I
100	4246.12	I
15000	4246.83	II
55	4283.56	
290	4294.77	II
350	4305.71	II
4200	4314.09	II
3300	4320.74	II
2400	4325.01	II
28	4348.53	I
180	4354.61	II
110	4358.64	I
55	4359.08	I
28	4364.92	I
2000	4374.46	II
130	4384.81	II
45 h	4389.60	I
1100	4400.37	II
880	4415.56	II
28	4420.66	II
45	4431.36	II
65	4542.55	I
90	4544.68	I
120 h	4557.24	I
160 h	4573.99	I
65 h	4592.94	I
65 h	4598.45	I
55 h	4604.72	I
45	4609.53	I
45	4609.95	I
350	4670.40	II
40 h	4680.49	I
50	4698.29	II
120	4706.97	I

Sc I and II

Intensity	Wavelength	
120	4709.34	I
200	4728.77	I
490	4729.23	I
40 h	4732.30	I
590	4734.10	I
60	4735.08	
690	4737.65	I
790	4741.02	I
1200	4743.81	I
200	4753.16	I
220	4779.35	I
90	4791.50	I
100	4827.28	I
100	4833.67	I
170	4839.44	I
40	4840.47	I
80	4847.68	I
80	4852.68	I
140ld	4857.79	ScO
	4858.09	ScO
80	4906.67	I
90	4909.76	I
90	4922.84	I
90	4934.25	I
45	4935.74	I
70	4941.33	I
170	4954.06	I
120	4973.66	I
150	4980.37	I
80	4983.45	I
140	4991.92	I
80	5018.39	I
70	5020.14	I
80	5021.51	I
530	5031.02	II
55	5032.74	I
250	5064.32	I
80	5068.86	I
530	5070.23	I
250	5075.81	I
2100	5081.56	I
1200	5083.72	I
1100	5085.55	I
750	5086.95	I
390	5087.14	I
270	5089.89	I
45	5092.46	I
390	5096.73	I
620	5099.23	I
370	5101.12	I
180	5109.06	I
150	5112.86	I
320	5116.69	I
70 b	5133.68	ScO
45 b	5171.06	ScO
390	5210.52	I
45	5211.28	I
280	5219.67	I
350	5239.82	II
280	5258.33	I
35	5284.97	I
210	5285.76	I
35	5301.94	I
22	5318.35	II
70	5331.77	I
14	5334.23	II
95	5339.41	I
120	5341.05	I
95	5342.96	I

Sc I and II

Intensity	Wavelength	
350	5349.30	I
120	5349.71	I
60	5350.30	I
210	5355.75	I
530	5356.10	I
14	5357.19	II
270	5375.35	I
370	5392.08	I
45	5416.12	I
45	5425.57	I
45	5429.41	I
35	5432.94	I
55	5433.23	I
45	5438.22	I
55	5439.03	I
55 h	5442.60	I
270	5446.20	I
18	5447.39	I
120	5451.34	I
30	5455.21	I
18	5465.20	I
55	5468.40	I
60	5472.19	I
18	5474.64	I
750	5481.99	I
530	5484.62	I
570	5514.22	I
16	5515.39	I
660	5520.50	I
45	5526.06	I
660	5526.82	II
55	5541.04	I
30	5546.40	I
18	5550.40	I
5	5552.25	II
35	5553.59	I
16	5561.10	I
70	5564.86	I
18	5571.24	I
14	5579.76	I
110	5591.33	I
35 h	5593.38	I
22	5604.19	I
22	5631.02	I
80	5640.98	II
45	5646.36	I
16	5647.60	I
55	5649.56	I
250	5657.88	II
60	5658.34	II
55	5667.16	II
70	5669.04	II
1500	5671.81	I
95	5684.20	II
1200	5686.84	I
1100	5700.21	I
190	5708.61	I
880	5711.75	I
230	5717.28	I
180	5724.08	I
55bl	5736.85	ScO
55bl	5764.45	ScO
95bl	5772.74	ScO
55bl	5775.32	ScO
70bl	5809.84	ScO
70bl	5811.60	ScO
95bl	5847.73	ScO
70bl	5849.07	ScO
70 b	5887.38	ScO

Sc I and II

Intensity	Wavelength	
35bl	5918.04	ScO
30	5919.11	I
60bl	5928.10	ScO
35	5961.49	I
60bl	5968.25	ScO
35	5969.19	I
90	5988.42	I
160bl	6017.07	ScO
60	6026.18	I
620bl	6036.17	ScO
490bl	6064.31	ScO
440bl	6072.65	ScO
620bl	6079.30	ScO
320bl	6101.87	ScO
370bl	6109.93	ScO
370bl	6115.97	ScO
180 b	6148.70	ScO
150 b	6153.93	ScO
150 b	6188.09	ScO
150 b	6192.90	ScO
620	6210.68	I
90	6239.41	I
320	6239.78	I
120	6245.63	II
110	6249.96	I
250	6258.96	I
60	6262.25	I
55	6276.31	I
45	6279.76	II
18	6300.70	II
750	6305.67	I
26	6309.90	II
16	6320.85	II
26	6344.83	I
60	6378.82	I
55bl	6408.41	ScO
90	6413.35	I
26 b	6437.08	ScO
55bl	6446.24	ScO
26 b	6457.78	ScO
35 b	6485.40	ScO
26 b	6495.90	ScO
55 b	6525.62	ScO
22 b	6535.30	ScO
45 b	6557.84	ScO
35 b	6566.88	ScO
18 b	6575.85	ScO
60	6604.60	II
26bl	6609.99	ScO
18bl	6617.94	ScO
18bl	6645.08	ScO
22bl	6654.42	ScO
26bl	6661.01	ScO
18 b	6700.48	ScO
18 b	6705.93	ScO
65	6737.87	I
35	6739.40	I
35	6817.08	I
50	6819.52	I
29	6829.54	I
50	6835.03	I
5 b	6963.12	ScO
5bl	6990.68	ScO
5bl	7025.72	ScO
8 b	7035.77	ScO
5 b	7072.37	ScO
5 b	7094.38	ScO
12 h	7138.14	I
14	7169.13	I

Sc I and II

Intensity	Wavelength	
12	7257.57	I
8	7275.57	I
3 h	7300.62	I
12 h	7524.13	I
14 h	7553.96	I
15 h	7574.44	I
11	7617.45	I
14 h	7665.72	I
30	7697.73	I
18	7729.72	I
55 h	7741.17	I
5 h	7750.37	I
5	7752.72	I
6 h	7771.06	I
15	7785.17	I
8	7794.68	I
30	7800.44	I
11	7821.64	I
11 h	8196.98	I
15	8241.13	I
19 h	8761.40	I
11 h	8774.8	
15 h	8794.72	I
15 h	8823.8	I
30 h	8834.35	I
70	20616.32	
30	20985.81	
400	22051.86	I
150	22065.05	I

Sc III

Ref. 323 - C.H.C.

Vacuum

10	730.60	III
15	731.65	III
15	1148.24	III
20	1154.52	III
20	1162.44	III
25	1168.61	III
10	1168.88	III
80	1598.00	III
180	1603.06	III
150	1610.19	III
40	1895.44	III
60	1912.62	III
90	1993.89	III

Air

160	2010.42	III
50	2012.26	III
350	2699.07	III
230	2734.05	III
10	2831.75	III
80	4061.21	III
100	4068.66	III
40	4309.47	III
10	4740.95	III
15	4780.87	III
50	4992.89	III
60	5032.09	III
80	6256.01	III
60	6307.60	III
90	7449.16	III
70	7548.15	III
70	7868.65	III
35	8814.29	III
50	8829.78	III
30	8865.89	III
15	8881.58	III

Sc IV

Ref. 298 - C.H.C.

Intensity	Wavelength	
	Vacuum	
8	220.28	IV
15	289.85	IV
15	296.31	IV
15	299.04	IV
10	371.16	IV
9	438.80	IV
8	557.50	IV
8	584.83	IV
9	617.08	IV
8	761.43	IV
8	769.70	IV
10	785.12	IV
8	789.00	IV
8	791.71	IV
8	861.24	IV
8	861.30	IV
8	890.87	IV
8	1219.40	IV
9	1228.20	IV
9	1424.66	IV
9	1444.10	IV
8	1489.64	IV
8	1514.96	IV
8	1535.76	IV
9	1543.86	IV
9	1549.55	IV
15	1550.80	IV
8	1555.72	IV
9	1563.81	IV
10	1574.92	IV
9	1583.41	IV
8	1584.64	IV
8	1592.23	IV
8	1660.71	IV
10	1665.92	IV
8	1746.23	IV
	Air	
10	2056.06	IV
8	2078.93	IV
12	2118.97	IV
9	2164.43	IV
11	2185.43	IV
11	2205.46	IV
14	2222.22	IV
11	2271.33	IV
9	2464.45	IV
8	2520.93	IV
11	2586.93	IV
9	2595.17	IV
8	2678.01	IV
8	2723.52	IV
8	2773.04	IV
8 d	4594.42	IV
8 d	4639.96	IV
8	5501.74	IV
9	5620.72	IV
10	5706.82	IV
14	5771.63	IV
9	6548.03	IV

Sc V

Refs. 150 - C.H.C.

	Vacuum	
150	179.42	V
350	180.14	V
200	180.82	V
200	180.96	V

Sc V

Intensity	Wavelength	
50	181.55	V
200	182.39	V
300	228.56	V
100	230.85	V
40	243.82	V
500	243.87	V
400	246.42	V
400	250.98	V
500	252.85	V
500	253.73	V
50	255.38	V
300	255.64	V
200	257.16	V
150	258.24	V
40	258.81	V
50	260.05	V
400	281.00	V
900	283.91	V
800	284.45	V
600	288.29	V
900	289.59	V
1000 d	291.93	V
800	293.25	V
400	296.17	V
700	300.00	V
400	375.05	V
100	378.68	V
200	388.68	V
400	395.32	V
200	399.50	V
1000	573.36	V
600	587.94	V

SELENIUM (Se)

Z = 34

Se I and II

Refs. 80,181,216,275 - R.L.K.

Vacuum

Intensity	Wavelength	
285	828.5	II
360	832.7	II
285	906.6	II
360	912.9	II
360	1013.4	II
360	1014.0	II
450	1033.6	II
450	1049.6	II
360	1057.4	II
285	1097.8	II
360	1141.9	II
220	1156.0	II
285	1156.9	II
285	1168.5	II
450	1192.3	II
220	1205.7	II
220	1234.9	II
285	1291.0	II
285	1308.9	II
100	1405.4	I
100	1406.4	I
100	1406.6	I
120	1435.3	I
120	1435.8	I
100	1444.8	I
100	1446.8	I
100	1447.0	I
150	1449.2	I

Se I and II

Intensity	Wavelength	
120	1456.3	I
150	1500.9	I
250	1530.4	I
150	1531.3	I
200	1531.8	I
120	1547.1	I
120	1560.3	I
150	1575.3	I
150	1577.6	I
150	1577.9	I
150	1579.5	I
200	1580.0	I
150	1587.5	I
150	1593.2	I
250	1606.5	I
100	1610.7	I
100	1611.3	I
200	1617.4	I
150	1621.2	I
100	1622.7	I
120	1626.2	I
150	1643.4	I
250	1671.2	I
250	1675.3	I
250	1690.7	I
250	1793.3	I
300	1795.3	I
300	1855.2	I
250	1858.8	I
400	1898.6	I
350	1913.8	I
300	1919.2	I
500	1960.9	I
150	1995.1	I

Air

500	2039.8	I
500	2074.8	I
500	2164.2	I
150	2332.8	I
600	2413.5	I
300	2548.0	I
220	3038.7	II
220	3041.3	II
285	4070.2	II
360	4175.3	II
450	4180.9	II
120	4328.7	I
100	4330.3	I
285	4382.9	II
285	4446.0	II
220	4449.2	II
285	4467.6	II
500	4730.8	I
400	4739.0	I
300	4742.2	I
285	4840.6	II
360	4845.0	II
450	5227.5	II
360	5305.4	II
100	5365.5	I
120	5369.9	I
110	5374.1	I
285	5522.4	II
285	5566.9	II
285	5866.3	II
450	6056.0	II
200	6325.6	I
360	6444.2	II
285	6490.5	II

Se I and II

Intensity	Wavelength	
285	6535.0	II
150	6831.3	I
120	6990.690	I
100	6991.792	I
200	7010.809	I
150	7013.875	I
300	7062.065	I
200	7575.1	I
250	7583.4	I
150	7592.2	I
120	7606.8	I
300	8001.0	I
200	8036.4	I
120	8060.9	I
120	8065.3	I
120	8081.1	I
150	8093.2	I
150	8094.7	I
180	8149.3	I
150	8152.0	I
200	8157.7	I
180	8163.1	I
150	8182.9	I
100	8185.0	I
120	8194.6	I
150	8440.47	I
150	8450.38	I
150	8742.33	I
300	8918.86	I
100	8969.69	I
200	9001.97	I
200	9038.61	I
80	9083.14	I
120	9088.79	I
80	9140.83	I
60	9181.88	I
60	9271.12	I
100	9432.50	I
60	9825.58	I
200	10217.25	I
377	10307.45	I
900	10327.26	I
640	10386.36	I
124	10650.30	I
125	11934.56	I
275	11946.87	I
100	11947.92	I
105	11952.27	I
170	11952.64	I
100	11966.04	I
205	11972.93	I
115	11973.07	I
315	14817.93	I
410	14917.47	I
500	15151.44	I
115	15469.06	I
320	15471.00	I
265	15520.97	I
395	15618.40	I
115	15620.38	I
360	16659.44	I
505	16813.78	I
165	16817.76	I
205	16866.54	I
115	16972.71	I
235	21374.24	I
680	21442.56	I
415	21473.48	I
270	21716.36	I

Se I and II

Intensity	Wavelength	
240	21730.60	I
105	23133.66	I
150	23388.85	I
110	23628.17	I
265	24148.18	I
170	24159.23	I
185	24204.44	I
375	24385.99	I
160	24413.67	I
225	24471.17	I
255	25017.51	I
510	25127.43	I

Se III

Refs. 9,247 - R.L.K.

Vacuum

220	709.2	III
220	709.4	III
220	720.6	III
360	724.3	III
285	726.4	III
220	737.2	III
220	741.9	III
285	777.3	III
220	790.8	III
360	843.0	III
220	879.2	III
285	953.7	III
220	954.4	III
220	954.7	III
160	974.1	III
360	974.8	III
285	1079.8	III
360	1099.1	III
450	1119.2	III

Air

285	2057.5	III
285	2767.2	III
220	2773.8	III
285	3379.8	III
450	3387.2	III
450	3413.9	III
285	3428.4	III
450	3457.8	III
360	3543.6	III
285	3570.2	III
450	3637.6	III
360	3711.7	III
450	3738.7	III
285	3743.0	III
450	3800.9	III
360	4046.7	III
220	4083.2	III
450	4169.1	III
220	4637.9	III
285	6303.8	III

Se IV

Ref. 245 - R.L.K.

Vacuum

285	636.0	IV
285	654.2	IV
360	652.7	IV
450	670.1	IV
285	671.9	IV
220	722.8	IV
285	734.6	IV
450	746.4	IV
285	759.0	IV
285	776.5	IV

Se IV

Intensity	Wavelength	
285	803.8	IV
360	959.6	IV
450	996.7	IV
220	1307.2	IV
285	1314.4	IV
	Air	
220	2090.0	IV
285	2136.6	IV
160	2165.2	IV
160	2166.6	IV
360	2665.5	IV
285	2724.3	IV
160	2951.6	IV

Se V

Ref. 245 - R.L.K.

Vacuum		
285	596.0	V
285	601.0	V
220	608.7	V
360	613.0	V
285	614.3	V
450	759.1	V
285	785.8	V
285	804.3	V
360	808.7	V
220	814.8	V
220	820.7	V
360	830.3	V
450	839.5	V
360	845.8	V
360	1094.7	V
220	1151.0	V
450	1227.6	V

SILICON (Si)

Z = 14

Si I and II

Refs. 170,237,292 - L.J.R.

Vacuum		
10 h	805.10	II
20 h	820.52	II
20 h	843.72	II
40 h	845.77	II
10	850.14	II
100	889.72	II
200	892.00	II
10	899.41	II
20	901.74	II
10	913.01	II
20	913.85	II
20	929.81	II
100	989.87	II
200	992.68	II
25	1020.70	II
50	1023.69	II
30	1057.05	II
15	1057.50	II
20 h	1127.44	II
40 h	1127.91	II
100	1190.42	II
200	1193.28	II
250	1194.50	II
100	1197.39	II
10 h	1216.12	II
20	1223.91	II
20	1224.25	II
10	1224.97	II

Si I and II

Intensity	Wavelength	
50	1226.81	II
20	1226.89	II
40	1226.99	II
100	1227.60	II
10	1228.44	II
25	1228.62	II
150	1228.75	II
200	1229.39	II
10	1235.92	II
100	1246.74	II
150	1248.43	II
100	1250.09	II
150	1250.43	II
200	1251.16	II
10	1255.28	I
40	1256.49	I
50	1258.80	I
1000	1260.42	II
2000	1264.73	II
200	1265.02	II
100	1304.37	II
50 h	1305.59	II
200	1309.27	II
20 h	1309.46	II
100	1346.87	II
100	1348.54	II
150	1350.06	II
20	1350.52	II
20	1350.66	II
100	1352.64	II
100	1353.72	II
10 h	1409.07	II
20 h	1410.22	II
10 h	1416.97	II
15 h	1474.65	II
15	1484.87	II
90 h	1485.02	II
30	1485.22	II
100 h	1485.51	II
100 h	1509.10	II
50 h	1512.07	II
30 p	1513.57	II
60 p	1516.91	II
500	1526.72	II
1000	1533.45	II
10	1562.45	II
15	1562.85	II
10	1563.77	II
50	1573.87	I
50	1574.82	I
50	1592.41	I
150	1594.55	I
50	1594.93	I
30	1597.95	I
100	1622.87	I
30	1625.71	I
300	1629.43	I
200	1629.92	I
75	1631.13	I
50	1633.98	I
30 h	1653.35	I
30	1664.52	I
50	1666.37	I
100	1667.62	I
100	1668.52	I
100	1672.59	I
200	1675.20	I
30	1682.68	I
30	1686.82	I

Si I and II

Intensity	Wavelength	
50 h	1689.29	I
30 h	1690.79	I
50	1693.29	I
50	1695.51	I
200	1696.20	I
200	1697.94	I
50	1700.42	I
30	1700.63	I
30	1702.86	I
50	1704.43	I
10 h	1710.83	II
20 h	1711.30	II
30 h	1743.88	I
50	1747.40	I
30 h	1753.11	I
50	1763.66	I
40	1765.03	I
30 h	1765.60	I
30	1766.06	I
30	1770.63	I
100 h	1770.92	I
100 h	1776.83	I
50 h	1783.23	I
100 h	1799.12	I
150	1808.00	II
50 h	1809.09	I
500 h	1814.07	I
200	1816.92	II
10	1817.45	II
50	1822.45	I
200	1836.51	I
30 h	1838.01	I
100 h	1841.15	I
200	1841.44	I
200	1843.77	I
300	1845.51	I
100	1846.10	I
400	1847.47	I
200	1848.14	I
100	1848.74	I
500	1850.67	I
30 h	1851.79	I
200	1852.46	I
50	1853.15	I
20	1869.32	II
15	1870.23	II
100	1873.10	I
500 h	1874.84	I
100	1875.81	I
200	1881.85	I
200	1887.70	I
200 h	1893.25	I
1000 h	1901.33	I
100 h	1902.46	II
50 h	1904.66	I
50 h	1910.62	II
50	1941.67	II
15	1944.59	II
10	1949.33	II
100	1949.56	II
100	1954.97	I
30	1984.43	I
50	1991.85	I
	Air	
30	2010.97	I
50	2054.83	I
50	2058.65	II
50	2059.01	II
40	2061.19	I

Si I and II

Intensity	Wavelength	
30	2065.52	I
200	2072.02	II
200	2072.70	II
30 h	2103.21	I
30	2114.63	I
100	2124.12	I
10 h	2133.99	II
30 h	2136.40	II
50 h	2136.56	II
50 h	2147.91	I
110	2207.98	I
115	2210.89	I
110	2211.74	I
120	2216.67	I
120	2218.06	I
50	2218.91	I
35	2291.03	I
55	2303.06	I
30	2334.40	II
30	2334.61	II
10	2344.20	II
10 h	2349.54	II
20	2350.17	II
20 h	2353.09	II
100 h	2356.30	II
30 h	2357.18	II
50 h	2357.97	II
10 h	2360.20	II
30	2366.97	II
20	2374.26	II
10 h	2428.45	II
300	2435.15	I
65	2438.77	I
65	2443.36	I
70	2452.12	I
425	2506.90	I
375	2514.32	I
500	2516.113	I
350	2519.202	I
425	2524.108	I
450	2528.509	I
110	2532.381	I
30	2563.679	I
85	2568.641	I
45	2577.151	I
190	2631.282	I
10 h	2682.21	II
1000	2881.579	I
10 h	2887.51	II
300	2904.28	II
500	2905.69	II
55	2970.355	I
150	2987.645	I
50	3006.739	I
100 h	3030.00	II
75	3020.004	I
20 h	3021.55	II
20 h	3041.57	II
30 h	3042.19	II
100 h	3043.69	II
10 h	3043.85	II
10 h	3045.77	II
50 h	3048.30	II
150 h	3053.18	II
150	3188.97	II
50	3192.25	II
150	3193.09	II
50	3194.21	II
50	3194.69	II

Si I and II

Intensity	Wavelength	
100	3195.41	II
200	3199.51	II
20	3202.49	II
100 h	3203.87	II
200 h	3210.03	II
75	3214.66	II
15 h	3217.99	II
10	3220.44	II
20	3223.01	II
300	3333.14	II
500	3339.82	II
100 h	3853.66	II
500 h	3856.02	II
200 h	3862.60	II
300	3905.523	I
10 h	3955.74	II
10 h	3977.46	II
15 h	3991.77	II
10 h	3998.01	II
20 h	4075.45	II
15 h	4076.78	II
70	4102.936	I
300 h	4128.07	II
500 h	4130.89	II
10 h	4183.35	II
100 h	4190.72	II
50	4198.13	II
100	4621.42	II
150	4621.72	II
50	4782.991	I
35	4792.212	I
80	4792.324	I
15 h	4883.20	II
20 h	4906.99	II
20 h	4932.80	II
30	4947.607	I
40	5006.061	I
1000	5041.03	II
1000	5055.98	II
100	5181.90	II
100 h	5185.25	II
200 h	5192.86	II
500 h	5202.41	II
30 h	5295.19	II
100 h	5405.34	II
15 h	5417.24	II
15 h	5428.92	II
15 h	5432.89	II
100 h	5438.62	II
20 h	5447.26	II
15 h	5454.49	II
100 h	5456.45	II
500 h	5466.43	II
500 h	5466.87	II
100 h	5469.21	II
40	5493.23	I
200 h	5496.45	II
35	5517.535	I
100 h	5540.74	II
150 h	5576.66	II
30	5622.221	I
100 h	5632.97	II
200 h	5639.48	II
90	5645.611	I
150 h	5660.66	II
80	5665.554	I
1000 h	5669.56	II
30 h	5681.44	II
120	5684.484	I

Si I and II

Intensity	Wavelength	
300 h	5688.81	II
100	5690.425	I
90	5701.105	I
200 h	5701.37	II
100 h	5706.37	II
160	5708.397	I
45	5747.667	I
45	5753.625	I
45	5754.220	I
45	5762.977	I
70	5772.145	I
70	5780.384	I
30 h	5785.73	II
90	5793.071	I
30 h	5794.90	II
100	5797.859	I
150 h	5800.47	II
200	5806.74	II
30	5827.80	II
50	5846.13	II
10	5867.48	II
300 h	5868.40	II
40	5873.764	I
150	5915.22	II
200	5948.545	I
500	5957.56	II
500	5978.93	II
10 h	6067.45	II
20 h	6080.06	II
10 h	6086.67	II
90	6125.021	I
85	6131.574	I
90	6131.850	I
100	6142.487	I
100	6145.015	I
160	6155.134	I
160	6237.320	I
40	6238.287	I
125	6243.813	I
125	6244.468	I
180	6254.188	I
45	6331.954	I
1000	6347.10	II
1000	6371.36	II
45	6526.609	I
45	6527.199	I
45	6555.462	I
50 h	6660.52	II
15	6665.00	II
100	6671.88	II
20	6699.38	II
50 h	6717.04	II
100	6721.853	I
30	6741.64	I
20 h	6750.28	II
30	6818.45	II
50	6829.82	II
30	6848.568	I
80	6976.523	I
180	7003.567	I
180	7005.883	I
30	7017.28	I
90	7017.646	I
250	7034.903	I
70	7164.69	I
200	7165.545	I
70	7184.89	I
65	7193.58	I
30	7193.90	I

Si I and II

Intensity	Wavelength	
100	7226.206	I
100	7235.326	I
60	7235.82	I
180	7250.625	I
160	7275.294	I
40	7282.81	I
400	7289.173	I
55	7290.26	I
35	7373.00	I
375	7405.774	I
200	7409.082	I
40	7415.35	I
275	7415.946	I
425	7423.497	I
85	7424.60	I
100	7680.267	I
40	7742.71	I
30	7800.008	I
400	7848.80	II
500	7849.72	II
30	7849.967	I
90	7918.386	I
120	7932.349	I
140	7944.001	I
35	7970.306	I
35	8035.619	I
70	8093.241	I
35	8230.642	I
40	8443.982	I
40	8501.547	I
60	8502.221	I
40	8536.165	I
120	8556.780	I
50	8648.462	I
40	8728.011	I
75	8742.451	I
100	8752.009	I
35	8790.389	I
100	9412.72	II
100	9413.506	I
30	10371.269	I
120	10585.141	I
120	10603.431	I
120	10660.975	I
30	10694.251	I
30	10727.408	I
60	10749.384	I
30	10784.550	I
80	10786.856	I
140	10827.091	I
60	10843.854	I
30	10868.79	I
130	10869.541	I
30	10882.802	I
30	10885.336	I
80	10979.308	I
30	10982.061	I
80	11017.965	I
13	11187.60	I
12	11289.84	I
12	11611.09	I
370	11984.19	I
220	11991.57	I
440	12031.51	I
150	12103.53	I
120	12270.68	I
11	13176.90	I
190	15888.39	I
40	15960.04	I

Si I and II

Intensity	Wavelength	
95	16060.03	I
20	16094.80	I
60	16163.71	I
11	16215.68	I
16	16381.55	I
29	16680.77	I
28	17327.29	I
26	18722.90	I
15	19385.94	I
48	19432.97	I
13	19493.38	I
110	19722.50	I
31	19928.88	I
12	20917.13	I
21	21354.24	I
12	22062.71	I

Si III

Ref. 320 - L.J.R.

Vacuum

8	566.61	III
6	652.22	III
8	653.33	III
5	673.48	III
5	800.07	III
9	823.41	III
5	883.40	III
7	939.09	III
9	967.95	III
10	993.52	III
13	994.79	III
16	997.39	III
7	1005.37	III
7	1031.16	III
8	1033.92	III
7	1037.05	III
6	1083.22	III
14	1108.37	III
16	1109.97	III
18	1113.23	III
6	1140.55	III
7	1141.58	III
6	1142.28	III
8	1144.31	III
6	1144.96	III
8	1145.11	III
7	1145.18	III
6	1155.00	III
6	1155.96	III
7	1158.10	III
6	1160.26	III
8	1161.58	III
5	1174.37	III
6	1174.43	III
8	1178.00	III
30	1206.51	III
30	1206.53	III
9	1207.52	III
10	1210.46	III
7	1235.43	III
6	1280.35	III
17	1294.54	III
14	1296.73	III
15	1298.89	III
18	1298.96	III
14	1301.15	III
16	1303.32	III
13	1312.59	III
8	1341.47	III

Si III

Intensity	Wavelength	
7	1342.39	III
6	1343.39	III
8	1361.60	III
5	1362.37	III
7	1363.47	III
8	1365.26	III
7	1367.05	III
5	1369.44	III
5	1373.03	III
5	1387.99	III
13	1417.24	III
6	1433.69	III
8	1435.77	III
7	1436.17	III
5	1441.73	III
6	1447.20	III
5	1457.25	III
12	1500.24	III
10	1501.19	III
9	1501.87	III
6	1506.06	III
7	1673.32	III
9	1842.55	III
	Air	
5	2176.89	III
6	2295.48	III
10	2296.87	III
8	2300.93	III
10	2308.19	III
11	2449.48	III
6	2483.20	III
25	2541.82	III
10	2546.09	III
14	2559.21	III
11	2640.79	III
14	2655.51	III
9	2817.11	III
7	2831.49	III
5	2839.62	III
5	2959.15	III
5	2980.52	III
5	3013.09	III
6	3034.73	III
8	3037.29	III
9	3040.93	III
7	3043.93	III
5	3045.08	III
7	3068.24	III
25	3086.24	III
6	3086.46	III
20	3093.42	III
5	3093.65	III
16	3096.83	III
6	3126.27	III
7	3147.37	III
8	3161.61	III
16	3185.13	III
13	3186.02	III
14	3196.50	III
15	3210.55	III
7	3216.25	III
12	3230.50	III
14	3233.95	III
15	3241.62	III
7	3253.40	III
5	3253.74	III
7	3254.80	III
12	3258.66	III
6	3270.46	III

Si III

Intensity	Wavelength	
10	3276.26	III
7	3279.26	III
15	3486.91	III
9	3525.94	III
8	3569.67	III
20	3590.47	III
8 h	3622.54	III
5 h	3639.45	III
6 h	3645.12	III
7 h	3681.40	III
5 h	3682.15	III
20 c	3791.41	III
25	3796.11	III
30	3806.54	III
7	3842.46	III
20	3924.47	III
6 h	3947.49	III
6	3963.84	III
5	3981.24	III
5 h	4101.86	III
8	4102.42	III
5 h	4115.50	III
9	4338.50	III
8	4341.40	III
8 h	4377.63	III
6 h	4405.90	III
8 h	4406.72	III
6	4494.05	III
30	4552.62	III
8	4554.00	III
25	4567.82	III
20	4574.76	III
7	4619.66	III
7	4638.28	III
8	4665.87	III
9	4683.02	III
7	4683.80	III
16	4716.65	III
7	4730.52	III
8	4800.43	III
15	4813.33	III
16	4819.72	III
18	4828.97	III
10 h	5091.42	III
7 h	5113.76	III
8 h	5114.12	III
5	5197.26	III
6	5451.46	III
7	5473.05	III
7	5704.60	III
8	5716.29	III
20	5739.73	III
10 h	5898.79	III
7	6314.46	III
6 h	6524.36	III
6 h	6831.56	III
7 h	6851.65	III
5 h	7461.89	III
8 h	7462.62	III
9 h	7466.32	III
12 h	7612.36	III
9 h	8102.86	III
11 h	8103.45	III
7 h	8190.43	III
6 h	8191.16	III
8 h	8191.68	III
9 h	8262.57	III
5 h	8265.64	III
8 h	8269.32	III

Si III

Intensity	Wavelength	
5 h	8271.38	III
6 h	8271.94	III

Si IV

Ref. 319 – L.J.R.

Vacuum

4	457.82	IV
3	458.16	IV
2	515.12	IV
3	516.35	IV
2	645.76	IV
5	749.94	IV
7	815.05	IV
8	818.13	IV
8	1066.63	IV
8	1122.49	IV
10	1128.34	IV
15	1393.76	IV
12	1402.77	IV
1	1634.61	IV
6	1722.53	IV
5	1727.38	IV
	Air	
3	2120.18	IV
4	2127.47	IV
5 h	2287.04	IV
2 h	2328.56	IV
2	2366.76	IV
3	2370.99	IV
2	2482.82	IV
1	2485.38	IV
7	2517.51	IV
1	2672.19	IV
4	2675.12	IV
4	2675.25	IV
1	2677.57	IV
3 h	2723.81	IV
3 h	2895.13	IV
2 h	2904.47	IV
1 h	2971.52	IV
7	3149.56	IV
9	3165.71	IV
1 h	3244.19	IV
8	3762.44	IV
6	3773.15	IV
1 h	4031.39	IV
2 h	4038.06	IV
10	4088.85	IV
9	4116.10	IV
7 h	4212.41	IV
3	4314.10	IV
5	4328.18	IV
2 h	4403.73	IV
1 h	4411.65	IV
1 h	4611.27	IV
3 h	4628.62	IV
9 h	4631.24	IV
10 h	4654.32	IV
3 h	4656.92	IV
1 h	4667.14	IV
2 h	4673.30	IV
1 h	4947.45	IV
3	4950.11	IV
2 h	5304.97	IV
1 h	5309.49	IV
5	6667.56	IV
7	6701.21	IV
3 h	6998.36	IV
6 h	7047.94	IV

Si IV

Intensity	Wavelength	
4 h	7068.41	IV
2 h	7630.50	IV
4 h	7654.56	IV
4 h	7678.75	IV
5 h	7718.79	IV
6 h	7723.82	IV
2 h	7725.64	IV
1 h	7730.47	IV
1 h	7752.91	IV
1 h	8240.61	IV
2 h	8957.25	IV
1 h	9018.16	IV

Si V

Ref. 87 – L.J.R.

Vacuum

1	78.61	V
1	78.90	V
2	80.81	V
2	81.11	V
10	85.18	V
6	85.58	V
4	90.45	V
4	90.85	V
15	96.44	V
10	97.14	V
2	98.21	V
20	117.86	V
20	118.97	V

SILVER (Ag)

Z = 47

Ag I and II

Refs. 13,99,255,286,289 – C.H.C.

Vacuum

25	730.83	II
30	752.80	II
15	1005.32	II
10	1065.49	II
12	1072.23	II
250	1074.22	II
150	1107.03	II
150	1112.46	II
60	1195.83	II
50	1223.33	II
50	1240.80	II
50	1246.87	II
55	1256.81	II
55	1257.55	II
50	1266.63	II
70	1273.67	II
65	1297.51	II
85	1311.20	II
55	1313.81	II
50	1314.61	II
60	1323.84	II
60	1342.09	II
50	1342.57	II
70	1346.62	II
50	1353.54	II
150	1364.50	II
100	1396.00	II
100	1410.93	II
90	1419.72	II
95	1432.60	II
100	1464.72	II
50	1466.23	II

Ag I and II		
Intensity	Wavelength	
50 r	1507.37	I
100 r	1515.63	I
50 r	1548.58	I
100	1555.16	II
100	1644.50	II
60	1651.52	I
50	1652.10	I
120	1682.82	II
10	1708.11	I
50	1709.27	I
125	1736.44	II
10 h	1766.14	I
75	1790.37	II
20	1847.71	I
100	1967.38	II
	Air	
150	2015.96	II
150	2033.98	II
200	2061.17	I
100	2069.85	I
80 r	2113.82	II
60	2145.60	II
15	2170.00	I
50	2186.76	II
60	2229.53	II
100 r	2246.43	II
75 r	2248.74	II
75	2280.03	II
30 h	2309.56	I
10 h	2312.60	I
70 r	2317.05	II
80 r	2320.29	II
70 r	2324.68	II
80 r	2331.40	II
70	2357.92	II
50 h	2375.02	I
75	2411.41	II
90 r	2413.23	II
100 r	2437.81	II
80	2447.93	II
80	2473.84	II
60	2506.63	II
50 h	2575.63	I
60	2660.49	II
60	2721.77	I
75	2767.54	II
100 h	2824.39	I
10 h	2926.77	I
20 h	2938.42	I
20	3099.10	I
30 h	3130.02	I
10 h	3170.58	I
90	3180.70	II
15 h	3215.67	I
10	3225.15	I
15	3233.18	I
100	3267.35	II
55000 r	3280.68	I
10 h	3305.67	I
28000 r	3382.89	I
10 h	3403.78	I
30	3469.16	I
70	3475.82	II
80	3495.28	II
20 h	3501.92	I
20	3508.03	I
15 h	3513.38	I
10	3521.12	I
50	3542.61	I

Ag I and II		
Intensity	Wavelength	
10 h	3547.16	I
10 h	3557.01	I
20 h	3586.67	I
10 h	3623.49	I
50 h	3624.68	I
75	3682.46	II
30	3682.50	I
80	3683.34	II
50 h	3709.20	I
10 h	3727.42	I
20 h	3753.14	I
200	3810.94	I
50	3811.78	I
100 h	3840.74	I
15	3847.85	I
50 h	3907.41	I
50	3909.31	II
50 h	3914.40	I
70	3920.10	II
10 h	3928.01	I
10 h	3940.43	I
10 h	3942.97	I
60	3949.43	II
100 h	3981.58	I
70	3985.19	II
10 h	3992.15	I
100 h	4055.48	I
10 h	4083.43	I
80	4085.91	II
100	4185.48	II
90 h	4210.96	I
100	4212.82	I
50	4311.07	I
20	4396.23	I
50 h	4476.04	I
20 h	4556.0	I
30 h	4615.69	I
80	4620.04	II
50	4620.46	II
60 h	4668.48	I
30 h	4677.60	I
100	4788.40	II
20 h	4796.2	I
30 h	4847.82	I
100	4874.10	I
20	4888.21	I
10 h	4917.5	I
10	4935.75	I
20 h	4992.89	I
80	5027.35	II
15 h	5123.50	I
1000	5209.08	I
10 h	5333.62	I
1000	5465.50	I
100	5471.55	I
20	5475.38	I
20 h	5545.67	I
10 h	5559.58	I
100	5667.34	I
10 h	6083.78	I
10 h	6268.50	I
20	6621.08	I
20	7359.96	I
320	7687.78	I
25	8005.4	II
15	8254.7	II
500	8273.52	I
20	8324.4	II
15	8379.5	II

Ag I and II		
Intensity	Wavelength	
25	8403.8	II
15	8492.5	II
30 h	8645.70	I
10 h	8704.85	I
12	8747.6	II
15	9000.9	II
10	12551.0	I
60	16819.5	I
20	17416.7	I
15	18307.9	I
15	18382.3	I
	Ag III	
Refs.	363,387,398 - R.D.C.	
	Vacuum	
200	709.80	III
200	713.85	III
100	717.73	III
200	718.53	III
300	726.96	III
350	730.04	III
150	730.28	III
150	730.94	III
200	736.57	III
100	738.13	III
200	740.98	III
200	742.29	III
200	748.30	III
150	755.73	III
100	758.27	III
200	767.19	III
250	768.33	III
150	769.61	III
350	776.38	III
200	782.91	III
150	785.76	III
200	789.08	III
250	792.35	III
200	796.54	III
250	797.91	III
400	799.41	III
300	808.88	III
150	816.12	III
180	822.39	III
200	838.11	III
120	1373.22	III
120	1374.76	III
110	1404.93	III
120	1413.90	III
120	1414.29	III
120	1428.61	III
120	1452.74	III
200	1456.41	III
100	1471.44	III
300	1489.01	III
150	1515.08	III
100	1524.23	III
120	1527.04	III
150	1541.14	III
150	1550.89	III
130	1553.04	III
130	1587.41	III
120	1589.28	III
100	1613.79	III
130	1619.14	III
100	1634.46	III
100	1652.24	III
130	1653.60	III
300	1654.43	III

Ag III		
Intensity	Wavelength	
700	1656.18	III
150	1657.10	III
100	1661.54	III
130	1670.75	III
150	1676.14	III
100	1681.07	III
500	1693.51	III
200	1705.06	III
150	1708.86	III
130	1717.68	III
200	1722.27	III
150	1726.76	III
250	1728.14	III
200	1747.34	III
120	1749.64	III
150	1750.89	III
750	1751.03	III
100	1760.57	III
150	1762.62	III
150	1768.70	III
100	1771.81	III
100	1783.85	III
100	1791.70	III
100	1792.69	III
150	1793.90	III
150	1802.24	III
150	1802.26	III
100	1802.77	III
300	1808.23	III
250	1816.83	III
150	1822.45	III
350	1828.83	III
250	1832.33	III
120	1832.50	III
100	1834.31	III
250	1836.10	III
150	1838.64	III
400	1840.14	III
100	1846.96	III
120	1849.93	III
150	1856.33	III
120	1858.91	III
100	1860.39	III
100	1860.64	III
350	1867.12	III
150	1868.10	III
100	1872.55	III
400	1873.45	III
250	1880.36	III
300	1889.57	III
400	1916.92	III
600	1917.08	III
200	1925.30	III
150	1946.32	III
100	1948.44	III
700	1957.62	III
120	1959.27	III
100	1960.86	III
400	1966.89	III
600	1975.92	III
500	1977.03	III
150	1981.87	III
200	1987.02	III
130	1995.16	III
	Air	
600	1999.59	III
300	2007.30	III
200	2011.49	III
150	2013.65	III

Ag III		
Intensity	Wavelength	
150	2041.33	III
150	2053.17	III
150	2053.83	III
200	2056.99	III
200	2081.04	III
300	2146.47	III
150	2149.19	III
600	2161.89	III
150	2166.21	III
150	2211.23	III
100	2238.40	III
500	2246.51	III
100	2286.50	III
700	2310.04	III
100	2386.85	III
300	2395.69	III
100	2469.62	III
100	2562.87	III

SODIUM (Na)

Z = 11

Na I and II		
Refs. 268,334 – T.K.M. Vacuum		
160	300.15	II
160	300.20	II
90	301.32	II
100	301.44	II
60	302.45	II
300	372.08	II
350	376.38	II
60	1293.97	II
50	1327.74	II
45	1347.54	II
90	1374.69	II
90	1404.68	II
45	1495.21	II
40	1496.01	II
45	1497.73	II
80	1506.41	II
60	1506.91	II
70	1513.10	II
60	1519.63	II
60	1657.92	II
90	1776.57	II
40	1778.24	II
60	1783.04	II
80	1787.19	II
45	1788.85	II
80	1798.41	II
45	1801.26	II
90	1807.09	II
60	1808.38	II
50	1821.70	II
45	1833.87	II
80	1835.22	II
45	1837.89	II
60	1841.82	II
70	1845.02	II
45	1850.15	II
70	1851.19	II
80	1853.17	II
45	1866.45	II
45	1873.37	II
60	1875.08	II
160	1881.91	II
50	1885.09	II

Na I and II		
Intensity	Wavelength	
45	1885.74	II
	Air	
80	2228.53	II
80	2303.58	II
300	2315.65	II
130	2393.28	II
100	2401.01	II
300	2420.99	II
300	2424.73	II
200	2439.14	II
250	2441.50	II
200	2448.72	II
200	2452.18	II
1000	2493.15	II
300	2502.84	II
450	2506.30	II
600	2515.46	II
600	2531.54	II
550	2586.31	II
600	2594.96	II
850	2611.81	II
300	2627.41	II
300	2631.81	II
160	2648.53	II
200	2651.31	II
200	2659.81	II
850	2661.00	II
200	2663.46	II
350	2666.46	II
1000	2671.83	II
200	2674.04	II
850	2678.09	II
650	2808.71	II
850	2809.52	II
350	2818.29	II
600	2829.87	II
800	2839.56	II
1000	2841.72	II
16	2852.81	I
15	2853.01	I
650	2856.51	II
800	2859.49	II
350	2861.02	II
750	2871.28	II
650	2872.95	II
900	2881.15	II
850	2886.26	II
700	2893.95	II
900	2901.14	II
800	2904.72	II
1100	2904.92	II
1100	2917.52	II
1100	2919.05	II
1200	2919.85	II
1300	2920.95	II
1000	2923.49	II
750	2930.88	II
850	2934.08	II
950	2937.74	II
450	2942.66	II
800	2945.70	II
950	2947.50	II
1200	2951.24	II
1100	2952.40	II
850	2960.12	II
450	2965.74	II
500	2970.73	II
600	2974.24	II
750	2974.99	II

Na I and II		
Intensity	Wavelength	
1000	2977.13	II
1100	2979.66	II
1100	2980.63	II
1300	2984.19	II
550	3004.15	II
750	3007.44	II
750	3009.14	II
450	3009.48	II
600	3015.40	II
450	3017.34	II
400	3029.07	II
400	3037.08	II
400	3045.60	II
550	3053.67	II
550	3055.35	II
550	3056.16	II
550	3057.38	II
550	3057.95	II
550	3058.72	II
700	3060.25	II
800	3061.35	II
500	3064.38	II
500	3066.22	II
500	3066.54	II
550	3074.33	II
550	3078.32	II
550	3080.25	II
550	3087.06	II
450	3088.26	II
550	3092.04	II
550	3092.73	II
650	3094.45	II
650	3095.55	II
500	3103.58	II
500	3104.40	II
450	3111.45	II
500	3113.69	II
400	3122.94	II
1700	3124.42	II
600	3125.21	II
600	3129.38	II
2500	3135.48	II
1700	3137.86	II
950	3145.71	II
2000	3149.28	II
2000	3163.74	II
700	3175.09	II
1000	3179.06	II
1700	3189.79	II
1600	3212.19	II
700	3234.93	II
1500	3257.96	II
650	3260.21	II
950	3274.22	II
1700	3285.60	II
1700	3301.35	II
19	3302.37	I
18	3302.98	I
1500	3304.96	II
1000	3318.04	II
950	3327.69	II
6	3426.86	I
1500	3533.05	II
1200	3631.27	II
850	3711.07	II
200	4081.37	II
300	4113.70	II
250	4123.08	II
250	4233.26	II

Na I and II		
Intensity	Wavelength	
2	4238.99	I
200	4240.37	II
250	4240.90	II
3	4242.08	I
4	4273.64	I
5	4276.79	I
2	4287.84	I
3	4291.01	I
250	4292.48	II
250	4292.86	II
250	4308.81	II
250	4309.04	II
250	4320.91	II
6	4321.40	I
7	4324.62	I
250	4337.29	II
4	4341.49	I
250	4344.11	II
5	4344.74	I
200	4368.60	II
200	4375.22	II
200	4387.49	II
8	4390.03	I
250	4392.81	II
9	4393.34	I
200	4405.12	II
6	4419.89	I
7	4423.25	I
200	4446.70	II
200	4447.41	II
200	4454.74	II
200	4455.23	II
200	4457.21	II
200	4474.63	II
200	4478.80	II
200	4481.67	II
200	4490.15	II
200	4490.87	II
10	4494.18	I
11	4497.66	I
200	4499.62	II
200	4506.97	II
200	4519.21	II
200	4524.98	II
200	4533.32	II
7	4541.63	I
8	4545.19	I
200	4551.53	II
160	4590.92	II
160	4722.23	II
160	4731.10	II
100	4732.50	II
160	4741.67	II
160	4768.79	II
100	4788.79	II
50	4814.75	II
50	4835.26	II
60	5143.11	II
100	5191.65	II
50	5203.33	II
80	5208.55	II
60	5390.63	II
70	5400.46	II
90	5414.55	II
5	5682.633	I
9	5688.204	I
32	5889.950	I
16	5895.924	I
60	6175.25	II

Na I and II

Intensity	Wavelength	
70	6199.26	II
70	6234.68	II
80	6260.01	II
80	6274.74	II
60	6310.80	II
60	6352.83	II
60	6358.05	II
70	6361.15	II
70	6366.41	II
60	6378.91	II
50	6475.29	II
90	6514.21	II
80	6524.68	II
130	6530.70	II
130	6544.04	II
130	6545.75	II
80	6552.43	II
4	7809.78	I
3	7810.24	I
5	8183.256	I
9	8194.824	I
7	8649.92	I
6	8650.89	I
4	9153.88	I
6	9465.94	I
7	9961.28	I
3	10572.28	I
10	10746.44	I
9	10749.29	I
8	10834.87	I
11	11381.45	I
12	11403.78	I
115	14767.48	I
30	22056.44	I
27	22083.67	I
24	23348.41	I
24	23379.13	I

Na III

Refs. 178,205,207 - T.K.M.

Vacuum

5	183.95	III
5 h	189.35	III
5	193.80	III
5 h	194.04	III
5 h	194.17	III
5	194.29	III
6	194.68	III
6	195.53	III
6	202.15	III
6	202.19	III
8	202.49	III
5 d	202.71	III
7 d	202.72	III
8	202.76	III
8 p	203.06	III
8	203.28	III
8	203.33	III
10	207.30	III
10 c	215.34	III
12	215.86	III
12	216.12	III
15	229.87	III
12	230.59	III
50 c	250.52	III
30	251.37	III
25	266.90	III
70	267.65	III
50	267.87	III

Na III

Intensity	Wavelength	
50	268.63	III
20 p	272.08	III
20	272.45	III
100	378.14	III
70	380.10	III
7	1336.76	III
7	1337.36	III
8	1340.67	III
9 d	1342.39	III
10	1342.73	III
11	1355.28	III
12	1361.90	III
11	1372.34	III
10	1420.89	III
10	1444.19	III
12	1449.31	III
11	1562.87	III
10	1565.29	III
10	1598.18	III
11	1688.94	III
10	1699.29	III
10	1711.12	III
11	1728.27	III
10	1731.11	III
10	1755.48	III
15	1807.07	III
10	1810.77	III
11	1811.67	III
10	1816.81	III
10 d	1835.22	III
10	1838.94	III
11	1844.36	III
12 d	1847.53	III
10 d	1847.59	III
15	1849.56	III
12	1850.38	III
10	1855.92	III
10	1856.71	III
10	1861.21	III
10	1880.66	III
10 d	1887.39	III
20 d	1887.47	III
15 d	1890.75	III
15	1900.16	III
10	1918.45	III
11	1923.96	III
14	1926.26	III
12	1927.24	III
12	1932.74	III
13	1933.89	III
10	1943.52	III
12	1946.43	III
12	1950.91	III
14	1951.24	III
10	1977.16	III
13	1985.57	III
10	1995.68	III

Air

10	2004.21	III
11	2005.22	III
11	2008.47	III
15	2011.87	III
11	2014.17	III
12	2017.03	III
12	2028.56	III
12	2031.13	III
11	2035.90	III
12	2041.66	III
12	2043.29	III

Na III

Intensity	Wavelength	
10	2044.82	III
10	2045.44	III
11	2051.48	III
10	2060.36	III
15	2066.60	III
13	2082.91	III
15	2140.72	III
14	2144.54	III
15	2202.83	III
15	2225.93	III
30	2230.33	III
16	2232.19	III
20 h	2246.70	III
14	2251.47	III
15	2278.42	III
13	2285.66	III
15	2309.99	III
18	2386.99	III
17	2394.03	III
15	2406.59	III
25	2459.31	III
18	2468.85	III
20	2474.73	III
25	2497.03	III
17	2510.26	III
15	2530.25	III
14	2542.80	III

Na IV

Ref. 206 - T.K.M.

Vacuum

4	136.551	IV
4	136.854	IV
4	139.961	IV
7	142.232	IV
6	142.359	IV
8	146.064	IV
7	146.302	IV
9	150.298	IV
7	150.543	IV
7 c	150.64	IV
8	150.687	IV
7	151.299	IV
7	155.083	IV
7	155.240	IV
7	155.448	IV
8	155.510	IV
8	156.537	IV
12	162.448	IV
10	163.190	IV
12	168.411	IV
10	168.546	IV
10	190.445	IV
10	199.772	IV
10 c	205.49	IV
10	319.644	IV
10	360.76	IV
12	408.684	IV
10	409.614	IV
15	410.372	IV
10	411.334	IV
13	412.242	IV
10	1580.50	IV
11	1582.18	IV
10	1582.33	IV
11 d	1583.98	IV
12	1584.14	IV
10 d	1586.99	IV
12 d	1587.05	IV

Na IV

Intensity	Wavelength	
10	1613.95	IV
11	1615.92	IV
12	1618.57	IV
11	1655.47	IV
15 c	1701.97	IV
10	1702.41	IV
12	1960.76	IV
11	1965.08	IV
10	1967.60	IV

Air

10	2018.39	IV
12 d	2106.33	IV
10	2114.53	IV
10	2155.76	IV

Na V

Ref. 299 - T.K.M.

Vacuum

100	106.28	V
100	106.30	V
100	106.40	V
100	106.49	V
200 c	107.93	V
200	108.02	V
200 c	110.82	V
200	110.88	V
100	111.51	V
300 c	112.01	V
100 h	114.70	V
100	114.74	V
400	117.99	V
100	120.04	V
400	125.18	V
400	125.22	V
500	125.29	V
300	125.43	V
300	125.46	V
200	125.90	V
100	126.21	V
200	126.56	V
100	126.61	V
400	127.44	V
400	127.47	V
400	128.03	V
400	128.05	V
200	130.68	V
300	131.35	V
200	131.41	V
300 h	131.64	V
500	133.16	V
400	133.39	V
200	134.27	V
300	135.79	V
300	135.85	V
200	138.81	V
300	138.92	V
400	148.64	V
300	148.86	V
400	151.13	V
300	157.21	V
300	163.62	V
800	307.15	V
1000	308.26	V
800	332.55	V
900	333.91	V
800	360.32	V
800	360.37	V
1000	400.72	V
500	445.05	V

Na V

Intensity	Wavelength	
600	445.19	V
600	459.90	V
850	461.05	V
1000	463.26	V

STRONTIUM (Sr)

Z = 38

Sr I and II

Refs. 1,218,279,313 - J.J.W.

Air

Intensity	Wavelength	
1400	2152.84	II
1400	2165.96	II
160	2428.10	I
120	2569.47	I
200	2931.83	I
300	3301.73	I
300	3329.99	I
400	3351.25	I
300	3366.33	I
650	3380.71	II
950	3464.46	II
120	3474.89	II
300 h	3940.80	I
600	3969.26	I
300	3970.04	I
1300	4030.38	I
300	4032.38	I
46000	4077.71	II
200	4161.80	II
32000	4215.52	II
340	4305.45	II
350 h	4438.04	I
	4526.10	II
	4585.91	II
65000	4607.33	I
3200	4722.28	I
2200	4741.92	I
1400	4784.32	I
4800	4811.88	I
3600	4832.08	I
500	4855.04	I
600	4868.70	I
3000	4872.49	I
600	4876.06	I
2000	4876.32	I
1000	4891.98	I
8000	4962.26	I
1300	4967.94	I
800 h	5156.07	I
1400	5222.20	I
2000	5225.11	I
2000	5229.27	I
2800	5238.55	I
4800	5256.90	I
	5303.13	II
350 h	5329.82	I
	5379.13	II
	5385.45	II
1500	5450.84	I
7000	5480.84	I
1100	5486.12	I
3500	5504.17	I
2600	5521.83	I
2000	5534.81	I
2000	5540.05	I
250 h	5543.36	I
	5622.94	II

Sr I and II

Intensity	Wavelength	
	5650.54	II
	5723.70	II
	5819.00	II
200 h	5970.10	I
250 h	6345.75	I
250 h	6363.94	I
350 h	6369.96	I
1000	6380.75	I
900 h	6386.50	I
600 h	6388.24	I
9000	6408.47	I
250	6446.68	I
250 h	6465.79	I
	6483.17	II
5500	6504.00	I
	6509.20	II
1000	6546.79	I
1700	6550.26	I
3000	6617.26	I
800	6643.54	I
1800	6791.05	I
4800	6878.38	I
1200	6892.59	I
5500	7070.10	I
60	7153.09	I
250 h	7167.24	I
200	7232.27	I
2500	7309.41	I
500	7621.50	I
400 h	7673.06	I
50 h	7850.00	I
30 h	7866.90	I
20 h	7874.00	I
200 h	8422.80	I
120	8505.69	II
200	8688.91	II
30	8719.56	II
40	9170.00	I
30	9204.50	I
20	9283.90	I
100	9294.10	I
15	9306.60	I
30	9319.20	I
60	9380.45	I
40 h	9411.25	I
400 h	9448.95	I
600	9596.00	I
300	9624.70	I
100	9638.10	I
100 h	9647.70	II
300	10036.66	II
1000	10327.31	II
7	10872.70	II
200	10914.88	II
10	10984.00	I
13	11224.57	II
700	11241.25	I
100	12014.76	II
20	12236.20	I
60	12445.90	II
20	12479.60	I
40	12495.00	I
15	12652.20	I
75	12974.70	II
100	13123.80	II
15	13522.80	I
15	17140.90	I
30	17170.50	I
50	17447.40	I

Sr I and II

Intensity	Wavelength	
4	17626.00	II
30	17743.00	I
15	19759.60	I
230	20261.40	I
120	20700.70	I
40	20764.50	I
15	20778.70	I
30	26023.60	I

Sr III

Refs. 231,265 - J.J.W.

Vacuum

25	307.18	III
50	316.11	III
50	321.61	III
125	330.67	III
500	351.62	III
75	358.80	III
250	363.49	III
150	371.21	III
1000	437.24	III
1875	491.79	III
1250	507.04	III
3750	514.38	III
2500	562.75	III
20	968.37	III
20	975.78	III
25	992.98	III
50	1025.23	III
35	1044.91	III
20	1057.74	III
25	1060.20	III
20	1098.77	III
35	1125.49	III
20	1140.24	III
20	1168.27	III
20	1182.09	III
50	1236.23	III
20	1940.58	III
30 p	1958.44	III
30	1966.92	III

Air

25	2068.63	III
50	2099.59	III
25	2114.31	III
30	2118.48	III
50	2119.52	III
50	2133.12	III
30	2142.80	III
20	2145.74	III
30	2178.91	III
30	2180.14	III
50	2190.88	III
50	2203.86	III
50	2219.50	III
50	2220.05	III
50	2267.03	III
100	2273.71	III
50	2277.87	III
30	2310.33	III
50	2314.95	III
50	2334.79	III
100	2340.13	III
50	2404.17	III
30	2410.52	III
50	2454.03	III
100	2486.52	III
50	2503.59	III
30	2599.10	III

Sr III

Intensity	Wavelength	
35	2622.69	III
30	2642.96	III
30	2648.51	III
35	2654.66	III
40	2722.47	III
50	2786.00	III
50	2821.42	III
30	2874.86	III
30	2929.34	III
30	2983.00	III
100	3002.61	III
200	3012.32	III
100	3021.73	III
30	3059.83	III
50	3061.43	III
30	3104.25	III
50	3182.61	III
100	3235.39	III
30	3302.72	III
50	3430.76	III
30	3874.26	III
30	3936.40	III
30	3936.72	III
30	3958.75	III
30	4094.03	III
30	4097.02	III
30	4105.63	III
35	4335.80	III
30	5071.09	III
30	5130.34	III
35	5158.26	III
40	5257.71	III
30	5262.21	III
30	5288.32	III
30	5391.03	III
40	5443.48	III
30	5463.90	III
30	5664.66	III
30	5689.72	III

Sr IV

Ref. 110 - J.J.W.

Vacuum

12	284.31	IV
12	291.09	IV
12	291.19	IV
12	293.22	IV
15	298.12	IV
15	300.12	IV
12	300.27	IV
12	301.67	IV
20	378.53	IV
75	392.44	IV
50	393.00	IV
45	394.90	IV
50	396.22	IV
40	399.92	IV
35	403.85	IV
35	406.94	IV
30	412.93	IV
40	413.07	IV
40	415.32	IV
30	419.78	IV
25	430.21	IV
30	430.65	IV
25	442.73	IV
25	471.76	IV
25	484.20	IV
25 p	508.14	IV

Sr IV

Intensity	Wavelength	
25	534.19	IV
200	664.43	IV
100	710.35	IV
20	1189.21	IV
30	1244.14	IV
20 p	1244.75	IV
20 p	1244.87	IV
20 p	1257.78	IV
20	1268.62	IV
20	1331.13	IV
30	1347.90	IV
20	1361.15	IV
25	1408.67	IV
20	1592.74	IV
25	1677.03	IV
20	1705.16	IV
20	1724.23	IV
25	1729.53	IV
20	1732.12	IV
20	1777.25	IV
20	1994.61	IV
	Air	
20	2104.38	IV
20	2117.90	IV
20	2217.99	IV
20	2230.41	IV
20	2240.49	IV
20	2253.38	IV
50	2346.97	IV
20	2357.34	IV
20	2438.93	IV
25	2441.41	IV
30	2482.79	IV
25	2483.57	IV
18	2500.57	IV
20	2508.02	IV
20	2534.03	IV
18	2548.02	IV
40	2555.60	IV
40	2571.04	IV
25	2571.58	IV
15	2589.34	IV
25	2620.35	IV
20	2621.16	IV
20	2642.16	IV
15	2830.53	IV
9	2934.60	IV
10	3019.29	IV
9	3266.52	IV
9	3566.43	IV
9	3741.05	IV
9	4298.57	IV
9	4685.08	IV

Sr V

Ref. 109 - J.J.W

Vacuum

10	517.28	V
6	540.51	V
25	578.01	V
30	624.93	V
25	642.23	V
50	649.21	V
20	659.15	V
25	660.94	V
9	669.93	V
35	686.23	V
6	715.79	V
12	747.82	V

Sr V

Intensity	Wavelength	
9	862.32	V

SULFUR (S)

Z = 16

S I and II

Refs. 144,209,210 - R.L.K.

Vacuum

40	906.9	II
40	910.5	II
40	912.7	II
40	937.4	II
40	937.7	II
20	996.0	II
20	1000.5	II
20	1014.4	II
20	1019.5	II
20	1096.6	II
40	1102.3	II
20	1131.0	II
20	1131.6	II
40	1234.1	II
40	1250.5	II
110	1253.8	II
110	1259.5	II
275	1270.782	I
250	1277.216	I
280	1295.653	I
275	1302.337	I
235	1302.863	I
235	1303.110	I
245	1303.430	I
260	1305.883	I
265	1310.194	I
355	1316.542	I
290	1316.618	I
375	1323.515	I
355	1326.643	I
775	1381.552	I
710	1385.510	I
960	1388.435	I
640	1389.154	I
775	1392.588	I
1000	1396.112	I
300	1409.337	I
510	1425.030	I
425	1433.280	I
300	1436.968	I
300	1448.229	I
425	1472.972	I
550	1473.995	I
300	1474.380	I
355	1481.665	I
485	1483.039	I
300	1483.233	I
330	1485.622	I
390	1487.150	I
680	1666.688	I
640	1687.530	I
710	1807.311	I
680	1820.343	I
640	1826.245	I
710	1900.286	I
550	1914.698	I
	Air	
20	2629.1	II
40	2670.0	II
40	2847.7	II

S I and II

Intensity	Wavelength	
285	3867.6	I
285	3902.0	I
360	3933.3	II
450	4120.8	I
280	4142.3	II
360	4145.1	II
450	4153.1	II
450	4162.7	II
450	4694.1	I
285	4695.4	I
160	4696.2	I
280	4716.2	II
450	4815.5	II
360	4924.1	II
450	4925.3	II
285	4993.5	I
360	5428.6	II
650	5432.8	II
1000	5453.8	II
1000	5473.6	II
1000	5509.7	II
280	5564.9	II
1000	5606.1	II
450	5640.0	II
450	5640.3	II
280	5647.0	II
650	5659.9	II
450	5664.7	II
160	5706.1	I
450	5819.2	II
450	6052.7	I
280	6286.4	II
450	6287.1	II
450	6305.5	II
450	6312.7	II
280	6384.9	II
280	6397.3	II
280	6398.0	II
360	6413.7	II
160	6743.6	I
285	6748.8	I
450	6757.2	I
450	7579.0	I
450	7629.8	I
285	7686.1	I
450	7696.7	I
1000	7924.0	I
160	7928.8	I
285	7930.3	I
450	7931.7	I
450	7967.4	I
450	7967.4	II
450	8314.7	I
450	8314.7	II
450	8585.6	I
285	8680.5	I
450	8694.7	I
360	8874.5	I
110	8882.5	I
220	8884.2	I
160	9035.9	I
450	9212.9	I
450	9228.1	I
450	9237.5	I
285	9413.5	I
285	9421.9	I
285	9437.1	I
650	9649.9	I
450	9672.3	I

S I and II

Intensity	Wavelength	
450	9680.8	I
450	9693.7	I
285	9697.3	I
285	9739.7	I
110	9741.9	I
285	9932.3	I
285	9949.8	I
285	9958.9	I
285	10455.5	I
70	10456.8	I
285	10459.5	I

S III

Refs. 209,210 - R.L.K.

Vacuum

70	729.5	III
110	732.42	III
70	735.2	III
70	738.5	III
70	789.0	III
70	796.7	III
70	824.9	III
70	836.3	III
285	1077.1	III
70	1194.0	III
70	1201.0	III
	Air	
110	2460.5	III
110	2489.6	III
160	2496.2	III
160	2499.1	III
220	2508.2	III
70	2636.9	III
220	2665.4	III
70	2680.5	III
110	2691.8	III
110	2702.8	III
220	2718.9	III
110	2721.4	III
220	2726.8	III
220	2731.1	III
110	2741.0	III
285	2756.9	III
110	2775.2	III
160	2785.5	III
70	2797.4	III
70	2856.0	III
110	2863.5	III
160	2904.3	III
70	2964.8	III
160	2986.0	III
70	3234.2	III
70	3324.9	III
110	3497.3	III
160	3632.0	III
70	3662.0	III
110	3709.4	III
160	3717.8	III
160	3838.3	III
160	3928.6	III
360	4253.6	III
110	4285.0	III
70	4332.7	III

S IV

Refs. 29,202,209 - R.L.K.

Vacuum

20	519.3	IV
20	520.1	IV
40	520.8	IV

S IV

Intensity	Wavelength	
20	522.0	IV
20	522.5	IV
20	551.2	IV
40	652.5	IV
40	653.0	IV
70	653.6	IV
40	654.0	IV
70	655.6	IV
20	655.9	IV
110	657.3	IV
40	660.9	IV
160	661.4	IV
40	663.7	IV
40	664.8	IV
70	666.1	IV
110	744.9	IV
110	748.4	IV
110	750.2	IV
110	753.8	IV
40	798.3	IV
70	800.5	IV
70	804.0	IV
70	809.7	IV
110	816.0	IV
160	1062.7	IV
160	1073.0	IV
70	1073.5	IV
20	1108.4	IV
20	1110.9	IV
20	1624.0	IV
20	1629.2	IV
	Air	
20	2387.0	IV
40	2398.9	IV
110	3097.5	IV
40	3117.7	IV

S V

Ref. 29 – R.L.K.

Vacuum		
5	437.4	V
5	438.2	V
5	439.6	V
40	658.3	V
70	659.8	V
110	663.2	V
5	676.2	V
5	677.3	V
20	678.1	V
40	680.3	V
110	680.9	V
40	681.6	V
5	686.2	V
5	686.9	V
5	689.8	V
5	691.7	V
20	693.5	V
285	786.5	V
160	849.2	V
110	852.2	V
220	854.8	V
110	857.9	V
110	860.5	V
20	883.6	V
20	884.5	V
5	885.8	V
20	900.9	V
5	902.8	V
20	905.9	V

TANTALUM (Ta)

Z = 73

Ta I and II

Ref. 1 – C.H.C.

Intensity	Wavelength	
	Air	
1100	2140.13	II
1500	2146.87	II
740	2150.62	II
600	2165.01	II
740	2178.03	II
1200	2182.71	II
540	2193.20	II
1100	2193.88	II
1500	2196.03	II
1500	2199.67	II
500	2207.14	II
1400 d	2210.03	II
	2210.19	II
420	2215.60	II
1400	2239.48	II
240	2248.48	II
480	2249.79	II
1200	2250.76	II
260	2254.86	II
440	2255.77	II
360	2256.51	II
500	2258.71	II
840	2261.42	II
260	2261.62	II
990	2262.30	II
220	2269.56	II
740	2271.85	II
990	2272.59	II
200	2279.85	I
320	2282.19	II
130	2285.02	II
790	2285.25	II
600	2286.59	II
240	2287.27	II
990	2289.16	II
180	2292.54	II
160	2295.18	
160	2301.47	II
440	2302.24	II
440	2302.93	II
300	2303.49	II
100	2308.46	II
440	2312.60	II
420	2315.46	II
260	2319.16	II
100	2331.29	II
690	2331.98	II
550	2332.19	II
110	2334.13	II
180	2334.88	II
140	2335.75	II
300	2338.28	II
200	2340.94	II
200	2341.61	II
130	2343.64	II
100	2346.42	II
90	2351.99	II
170	2353.86	II
120	2355.22	II
170	2356.05	II
140	2356.90	II

Ta I and II

Intensity	Wavelength	
250	2357.30	I
170	2359.16	II
260	2361.09	I
160	2362.78	II
130	2363.32	II
600	2364.24	II
50	2367.24	II
150	2369.32	II
300	2370.76	II
320	2371.58	I
100	2373.94	II
70	2375.91	I
150	2378.31	II
440	2381.13	II
240	2381.52	II
170	2383.72	II
240	2384.28	II
130	2385.73	I
1400	2387.06	II
80	2388.37	II
160	2389.11	II
70	2396.30	I
110	2399.15	I
50	2399.92	II
2400	2400.63	II
140	2402.13	II
100	2403.68	II
130	2406.55	I
130	2408.26	II
120	2414.32	I
240	2415.21	II
320	2416.89	II
220	2417.86	II
150	2418.77	II
140	2421.03	I
150	2421.85	II
170	2423.48	II
130	2425.91	II
360	2427.64	I
360	2429.71	II
170	2431.06	II
480	2432.70	II
130	2433.59	II
130	2436.51	II
110	2437.07	I
110	2438.64	II
200	2439.91	I
130	2442.39	I
100	2444.13	II
100	2447.17	I
100	2454.48	I
100	2458.68	I
100	2460.55	I
160	2463.82	II
130	2466.99	II
130	2467.37	II
380	2470.90	II
120	2471.38	I
120	2472.13	I
150	2473.13	I
120	2473.31	II
600	2474.62	I
120	2475.33	I
200	2476.67	II
150	2478.22	I
120	2481.86	II
100	2482.10	I
100	2482.58	II
100	2484.04	II

Ta I and II

Intensity	Wavelength	
500	2484.95	I
120	2486.70	I
600	2488.70	II
500	2490.46	I
600	2504.45	I
600	2507.45	I
240	2512.65	I
1200 d	2526.35	I
600	2532.12	II
240	2545.49	II
240	2546.80	I
460 d	2551.07	I
460	2554.62	II
240	2555.05	I
1200	2559.43	I
460	2562.10	I
340	2571.51	II
430	2573.54	I
390	2573.79	I
600	2577.37	II
340	2577.78	I
210	2580.16	I
340	2584.03	II
430	2593.08	I
410	2593.66	II
310	2594.25	II
560	2595.26	I
310 l	2596.45	II
220	2600.14	I
600	2603.49	II
1400	2608.63	I
210	2609.00	I
310 d	2611.34	I
340	2615.46	I
310	2615.66	I
1200	2635.58	II
470	2636.67	I
860	2636.90	I
510	2646.22	I
600	2646.37	I
2400	2647.47	I
270	2651.22	II
2600	2653.27	I
1900	2656.61	I
1500	2661.34	I
220	2665.60	II
220	2668.07	I
600	2668.62	I
770	2675.90	II
270	2680.06	II
220	2680.66	II
600	2684.28	I
1500	2685.17	II
340	2691.31	I
260	2692.40	I
470	2694.52	II
240	2696.81	I
1000	2698.30	I
470	2706.69	I
310	2709.27	II
1200	2710.13	I
2600	2714.67	I
240	2717.18	I
470	2720.76	I
470	2727.44	II
410	2727.78	I
310	2736.25	II
210	2739.26	II
210	2743.59	I

Ta I and II			Ta I and II			Ta I and II			Ta I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
510	2746.68	I	210	3274.95	II	450	4681.88	I	23	5931.05	I
1200	2748.78	I	1100	3311.16	I	130	4691.90	I	20	5931.68	I
860	2749.83	I	210	3317.93	I	150	4740.16	I	18	5935.54	I
410	2752.49	II	680	3318.84	I	220	4756.51	I	130	5939.76	I
1000	2758.31	I	330 d	3330.99	II	120	4768.98	I	240	5944.02	I
430	2761.68	II	230	3358.47	I	220	4812.75	I	25	5951.78	I
770	2775.88	I	640	3371.54	I	110	4920.11	I	18	5960.13	I
390	2787.69	I	360	3385.05	I	100	4921.27	I	190 c	5997.23	I
680	2796.34	I	230	3398.33	I	110	4926.00	I	25 h	6009.89	I
680	2797.76	II	450	3406.94	I	150	4936.42	I	25	6015.90	I
380	2802.07	I	230	3463.77	I	200	5037.37	I	100	6020.72	I
430	2806.30	I	490	3480.52	I	100	5067.87	I	250	6045.39	I
510	2806.58	I	380	3497.85	I	110	5115.84	I	100	6047.25	I
260	2817.10	II	240	3503.87	I	100	5141.62	I	25	6053.70	I
260	2842.82	I	490	3511.04	I	100	5143.69	I	30	6090.82	I
640	2844.25	I	200	3513.61	I	330	5156.56	I	18	6092.06	I
290	2844.46	II	750	3607.41	I	110	5212.74	I	100	6101.58	I
290 c	2845.35	I	980	3626.62	I	110 d	5218.45	I	25	6140.07	I
560	2848.52	I	500	3642.06	I		5218.66	I	65	6144.56	I
1500	2850.49	I	100	3686.18	I	140	5341.05	I	30	6152.54	I
1900	2850.98	I	100	3689.73	I	200	5402.51	I	130	6154.50	I
220	2858.44	II	130	3731.02	I	130	5419.19	I	40	6158.84	I
360	2861.98	I	140	3736.76	I	18	5500.68	I	15	6170.46	I
310	2868.65	I	130	3746.36	I	20	5505.66	I	15	6189.66	I
470	2871.42	I	110	3754.52	I	15 c	5516.27	I	15	6193.11	I
270	2873.36	I	110	3777.10	I	90	5518.91	I	25	6208.37	I
260	2873.56	I	110	3792.02	I	9	5521.15	I	40	6249.79	I
210	2874.17	I	210	3833.74	II	10	5523.98	I	150	6256.68	I
380	2880.02	I	100	3848.05	I	13	5528.36	I	150	6268.70	I
770	2891.84	I	100	3885.20	I	10 l	5545.20	I	50	6278.34	I
260	2899.04	I	210	3918.51	I	20	5548.32	I	65	6281.33	I
560	2902.05	I	140	3922.78	I	30	5584.02	I	15	6287.36	I
210	2914.12	I	140	3922.92	I	15	5598.75	I	40	6287.91	I
310	2915.49	I	210	3970.10	I	30	5599.52	I	40	6289.34	I
410	2925.19	I	210	3996.17	I	9 c	5605.50	I	50	6309.06	I
310	2932.70	I	100	3999.28	I	9 c	5617.71	I	150	6309.58	I
1700	2933.55	I	190	4006.84	I	40	5620.68	I	25 c	6312.22	I
470	2940.06	I	190	4026.94	I	13	5628.20	I	75	6325.08	I
1200	2940.22	I	140	4029.94	I	20	5635.71	I	50	6332.91	I
240	2942.14	I	120	4040.87	I	40	5640.18	I	65	6341.17	I
510	2951.92	I	410	4061.40	I	150	5645.91	I	30	6346.02	I
340	2953.56	I	210	4064.63	I	130	5664.90	I	75	6356.16	I
1500	2963.32	I	100	4067.24	I	30	5688.25	I	65	6360.84	I
770	2965.13	II	310	4067.91	I	40	5699.24	I	40	6373.06	I
770	2965.54	I	120	4105.02	I	15	5704.31	I	15	6379.07	I
340	2969.47	I	210	4129.38	I	25	5706.28	I	90	6389.45	I
430	2975.56	I	230	4136.20	I	30	5715.24	I	23 h	6392.21	I
210	3011.88	I	230	4147.89	I	8	5716.53	I	65	6428.60	I
1800	3012.54	II	210	4175.21	I	23	5746.71	I	250	6430.79	I
290 d	3027.48	I	100	4177.92	I	30	5755.81	I	13	6437.36	I
290	3042.06	II	130	4181.15	I	15 h	5761.61	I	40	6444.61	I
530	3049.56	I	300	4205.88	I	25	5766.56	I	30	6445.87	I
530	3069.24	I	120	4206.40	I	30 c	5767.91	I	200	6450.36	I
360	3077.24	I	130	4245.35	I	10	5771.93	I	20	6455.83	I
560	3103.25	I	130	4268.26	I	130	5776.77	I	30	6459.92	I
380	3124.97	I	160 c	4302.98	I	25	5780.02	I	380	6485.37	I
380	3130.58	I	110	4355.14	I	90	5780.71	I	18 h	6502.43	I
270	3132.64	I	100	4378.82	I	130	5811.10	I	65	6505.52	I
320	3170.29	I	150	4386.07	I	25	5816.51	I	100	6514.39	I
270	3173.59	I	110	4398.45	I	45 c	5843.94	I	100	6516.10	I
200	3176.29	I	180	4402.50	I	13	5849.68	I	25 h	6561.60	I
600	3180.95	I	130	4415.74	I	15	5866.61	I	25cw	6564.26	I
240	3184.55	I	360 c	4510.98	I	240	5877.36	I	100	6574.84	I
200	3198.67	I	190	4530.85	I	130	5882.30	I	10	6585.13	I
200	3213.91	II	130	4551.95	I	90	5901.91	I	15 c	6587.16	I
300	3223.83	I	170	4565.85	I	30	5916.51	I	110	6611.95	I
230	3229.24	I	340	4574.31	I	90	5918.95	I	75	6621.30	I
200	3242.05	I	260	4619.51	I	15	5925.90	I	15cw	6662.24	I
200	3242.83	I	130	4669.14	I	15	5930.62	I	100	6673.73	I

Ta I and II

Intensity	Wavelength	
180	6675.53	I
30	6684.00	I
15	6693.61	I
15	6706.46	I
25	6709.39	I
10	6714.44	I
15 h	6723.61	I
75 c	6740.73	I
40	6754.91	I
13 c	6755.85	I
13	6770.37	I
75	6771.74	I
40cw	6774.25	I
40cw	6788.99	I
13 c	6790.06	I
13	6799.27	I
40 c	6810.46	I
160 c	6813.25	I
20	6819.36	I
18 c	6824.96	I
13	6832.00	I
15	6850.83	I
15	6865.13	I
210	6866.23	I
180	6875.27	I
40	6877.49	I
15	6896.77	I
40	6900.55	I
150	6902.10	I
140	6927.38	I
140	6928.54	I
8 h	6939.33	I
20 c	6946.87	I
65	6951.26	I
45	6953.88	I
180	6966.13	I
8	6969.49	I
8 c	6971.31	I
9	6971.53	I
23	6983.52	I
110 d	6995.22	I
	6995.49	I
20	7000.21	I
40	7005.07	I
75	7006.96	I
50	7025.03	I
13	7031.51	I
40	7039.07	I
15 h	7081.30	I
20	7085.40	I
23	7093.02	I
8	7108.05	I
15 c	7117.52	I
20	7121.27	I
40	7125.72	I
150	7148.63	I
110	7172.90	I
13 c	7174.91	I
13	7191.35	I
8	7233.45	I
30 h	7250.27	I
11 h	7264.82	I
6	7272.29	I
30	7276.96	I
5	7277.54	I
9	7286.36	I
13 c	7296.32	I
140	7301.74	I
20	7319.84	I

Ta I and II

Intensity	Wavelength	
11 c	7322.72	I
13	7325.95	I
11cw	7340.19	I
160	7346.41	I
140 c	7352.86	I
100	7356.96	I
90cw	7369.09	I
160	7407.89	I
11 c	7435.19	I
23	7440.17	I
30	7467.75	I
23	7486.01	I
30	7520.56	I
6	7569.23	I
9	7590.22	I
6	7649.62	I
11 h	7722.02	I
11	7763.11	I
9 c	7779.67	I
20 c	7842.76	I
100	7882.37	I
30	7950.19	I
5	7952.07	I
6	7998.75	I
6	8022.09	I
75	8026.50	I
5	8029.04	I
15	8039.08	I
8	8053.93	I
15	8068.98	I
5	8100.11	I
13	8128.76	I
9	8158.54	I
5 c	8180.74	I
13 c	8248.95	I
20 d	8264.85	I
75	8281.62	I
11	8389.06	I
5	8415.73	I
25cw	8447.62	I
11 h	8550.49	I
15	8575.92	I
10cw	8595.84	I

Ta IV

Ref. 411 - R.L.K.

Vacuum

10	763.14	IV
32	934.41	IV
67	999.34	IV
65	1063.53	IV
68	1067.17	IV
71	1074.47	IV
71	1086.39	IV
72	1094.60	IV
68	1100.13	IV
79	1116.10	IV
71	1118.83	IV
78	1136.17	IV
66	1138.26	IV
75	1149.72	IV
75	1150.42	IV
75	1151.92	IV
76	1172.51	IV
85	1175.51	IV
80	1189.28	IV
78	1192.52	IV
80	1192.67	IV
78	1211.94	IV

Ta IV

Intensity	Wavelength	
80	1212.68	IV
85	1213.09	IV
70	1214.66	IV
85	1215.53	IV
80	1220.73	IV
80	1220.96	IV
90	1223.73	IV
88	1238.12	IV
95	1240.06	IV
87	1258.34	IV
94	1264.91	IV
98	1272.42	IV
94	1275.48	IV
86	1275.94	IV
92	1308.51	IV
85	1311.35	IV
87	1315.58	IV
81	1325.19	IV
92	1332.38	IV
86	1343.30	IV
75	1350.46	IV
92	1365.88	IV
79	1376.62	IV
78	1388.80	IV
91	1398.78	IV
93	1413.40	IV
79	1430.11	IV
83	1441.54	IV
91	1454.32	IV
92	1464.41	IV
93	1469.82	IV
90	1495.25	IV
95	1514.19	IV
70	1525.69	IV
82	1565.97	IV
82	1584.64	IV
84	1594.91	IV
85	1607.70	IV
84	1631.65	IV
79	1639.82	IV
84	1668.76	IV
84	1676.45	IV
85	1712.16	IV
85	1716.13	IV
82	1753.90	IV
82	1759.04	IV
79	1763.03	IV
83	1865.92	IV
84	1901.63	IV
84	1907.66	IV
84	1924.75	IV
77	1940.25	IV
79	1985.68	IV
82	1989.44	IV

Air

85	2055.75	IV
83	2079.01	IV
75	2111.53	IV
90	2199.58	IV
90	2207.64	IV
68	2697.42	IV
10	3076.06	IV

Ta V

Ref. 426 - R.L.K.

Vacuum

20	478.29	V
60	493.07	V
200	841.31	V

Ta V

Intensity	Wavelength	
1000	890.87	V
500	947.30	V
100	990.29	V
200	1066.64	V
200	1140.49	V
500	1213.42	V
100	1242.98	V
5000	1392.56	V
7000	1709.10	V

TECHNETIUM (Tc)

Z = 43

Tc I and II

Ref. 35 - C.H.C.

Air

15	2106.23	II
20	2116.44	II
15	2119.41	I
30	2156.27	I
30	2185.39	I
30	2189.06	I
40	2193.35	I
10	2266.22	II
10	2282.12	I
10	2282.71	I
50	2285.45	I
100	2298.08	I
30	2416.22	I
50	2423.23	I
20	2424.54	I
20	2435.83	I
10	2436.99	I
80 w	2463.69	I
20	2465.09	I
30	2466.87	I
20	2475.11	I
50	2480.70	I
50	2483.22	I
20	2486.50	I
25	2492.72	I
20	2493.43	I
100	2496.77	II
30	2510.17	I
80	2529.34	II
500	2543.23	II
60	2544.81	II
50	2547.92	II
50	2558.61	II
50	2567.01	II
30	2575.06	II
80	2576.28	II
40	2577.86	II
300hl	2578.79	I
200	2589.86	I
20 w	2590.19	I
100	2592.82	I
20	2597.19	II
500	2608.86	I
1000 c	2609.99	II
1500	2614.23	I
1000	2615.87	I
30	2618.28	I
200	2634.91	II
80	2636.36	I
30	2641.26	I
100	2642.37	I
40	2644.50	II

Tc I and II			Tc I and II			Tc I and II			Tc I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
1000 c	2647.01	II	500	2921.91	I	400	3366.75	I	200	3618.94	I
300 c	2649.21	I	20 c	2923.34	II	40	3386.67	I	1000 c	3627.36	I
100	2652.35	II	1000	2928.20	I	50	3392.23	I	200	3630.39	I
50	2653.57	I	80	2933.89	I	300	3394.18	I	3000 c	3635.15	I
100	2654.31	I	200	2955.93	I	60	3396.90	I	10000 c	3636.07	I
120	2660.88	I	200	2973.65	I	40	3397.83	I	1000	3638.22	I
100	2662.30	I	100	2979.34	I	300	3398.33	I	200	3638.85	I
80	2681.19	II	150	2985.36	I	200	3402.10	I	900	3639.38	I
60	2683.14	I	100	3010.83	I	200 c	3403.93	I	400	3640.23	I
80	2683.89	I	300	3017.23	I	80	3405.33	I	1000 c	3648.04	I
80	2693.11	I	150	3021.56	I	80	3407.28	I	600	3651.47	I
50	2696.64	I	100	3022.66	I	50	3408.33	I	1000 c	3658.59	I
70	2702.27	I	200	3023.68	I	40	3411.80	I	400 c	3661.45	I
40	2702.96	II	80	3025.26	I	40 c	3418.20	I	200	3664.92	I
100	2707.90	II	300 w	3026.89	I	100	3419.10	I	1000	3679.15	I
1000	2708.78	I	50	3033.16	I	60	3427.85	I	300	3680.32	I
30	2715.20	I	80	3034.57	I	40	3431.75	I	5000	3684.74	I
30	2723.55	I	40	3036.88	I	200	3434.70	I	300	3692.76	I
1000	2726.69	I	20	3037.90	II	40	3435.68	I	800	3703.83	I
30 c	2728.47	I	100	3038.23	I	150	3437.44	I	300	3704.80	I
500	2730.53	I	40	3042.64	I	80	3438.73	I	200	3706.70	I
300	2732.87	I	100 h	3051.55	I	200 c	3443.47	I	200	3707.63	I
150	2736.23	I	40	3052.47	I	200	3451.05	I	200	3708.26	I
60 c	2736.83	II	80	3062.11	I	200	3456.85	I	1000	3712.26	I
100	2737.97	I	200	3062.36	I	400	3457.24	I	300	3712.82	I
20 c	2738.83	II	300	3064.67	I	40	3457.60	I	500	3715.94	I
100	2755.76	I	100 c	3066.60	I	5000 c	3466.28	I	10000	3718.86	I
100	2762.13	I	120 c	3068.34	I	150	3470.51	I	1500	3723.67	I
200	2762.34	I	80	3076.24	I	80	3475.18	I	2000	3724.40	I
60	2765.95	I	150	3089.34	I	1000	3475.59	I	5000	3726.35	I
500	2766.89	I	1000	3099.10	I	60	3484.62	I	200	3727.36	I
20	2777.31	II	200	3099.52	I	1000 c	3486.23	I	400 c	3729.18	I
150	2778.91	I	60	3108.25	I	100	3490.30	I	500	3731.74	I
25	2781.22	I	40	3109.15	I	400	3493.39	I	300	3737.42	I
1000	2782.05	I	60	3115.98	I	500	3494.62	I	400	3745.01	I
500	2785.59	I	80	3119.17	I	40	3499.14	I	1000	3746.15	I
40	2788.89	I	40	3119.66	I	1000	3500.70	I	5000	3746.84	I
500	2789.25	I	700	3122.64	I	200	3501.24	I	1000	3752.13	I
100	2794.53	I	1500	3131.23	I	800 c	3502.70	I	4000	3754.37	I
80	2795.65	I	40 c	3150.26	I	100 c	3507.19	I	1000	3758.54	I
200	2795.78	II	300	3161.67	I	100	3508.27	I	2000	3761.81	I
1000	2802.81	I	3000	3173.30	I	100	3510.91	I	5000	3768.77	I
150	2803.02	I	200	3180.30	I	800	3525.83	I	3000	3771.03	I
500	2808.36	I	2000	3182.37	I	300	3526.18	I	500	3777.27	I
50 c	2809.65	II	2000	3183.11	I	100	3529.83	I	2000	3779.37	I
500	2811.61	II	800 c	3195.20	II	150	3534.88	I	3000 c	3780.68	I
30	2814.86	I	40 w	3197.53	I	500	3535.51	I	500	3784.06	I
40	2819.46	I	300 c	3202.83	I	300	3538.12	I	200	3786.06	I
100	2821.35	II	1000	3212.02	II	800	3538.68	I	500	3791.28	I
200	2828.04	I	40	3220.74	I	2000 c	3541.77	I	300	3791.73	I
60	2831.18	II	60	3230.02	I	6000 c	3549.72	I	200	3797.44	I
50	2840.38	II	1000	3237.02	II	4000 c	3550.64	I	1000	3797.77	I
60	2845.04	I	100	3241.84	I	300	3559.75	I	200	3814.67	I
10	2846.39	II	500	3244.19	I	800	3560.32	I	300	3816.89	I
60	2849.20	I	300	3252.05	I	100	3565.22	I	300	3824.47	I
150	2850.96	I	40	3256.10	I	800	3568.85	I	500	3828.54	I
500 h	2857.13	I	40	3261.94	I	100	3570.65	I	200	3830.35	I
2000 c	2859.11	I	100	3287.14	I	100	3575.42	I	200	3832.45	I
500	2864.49	I	30	3298.84	II	1000	3580.06	I	600	3832.82	I
100	2868.09	I	100	3300.77	I	600	3581.26	I	1500	3837.56	I
1000	2887.73	I	80	3305.89	I	800	3582.08	I	800	3841.31	I
100	2888.46	I	200	3310.65	I	2000	3582.63	I	800	3845.97	I
30	2889.20	II	150	3313.65	I	4000	3587.94	I	500	3847.60	I
200	2893.16	I	200	3325.55	I	200	3593.47	I	300	3851.22	I
150	2893.45	I	150 c	3327.10	I	300	3594.57	I	500 c	3856.73	I
200	2894.32	I	100	3330.77	I	1000 c	3595.66	I	200	3863.07	I
1000	2896.34	I	50	3332.47	I	1000 c	3607.32	I	400	3864.11	I
40	2903.81	I	60	3350.56	I	200	3607.62	I	1000	3868.24	I
1000	2913.15	I	50 c	3350.83	I	2000 c	3608.27	I	200	3875.66	I

Tc I and II			Tc I and II			Tc I and II			Tc I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
500 c	3879.16	I	1000	4515.98	I	100	5005.74	I	60	6047.99	I
600 c	3880.72	I	10000	4522.84	I	200 c	5014.52	I	200	6065.09	I
300 w	3892.12	I	2000	4539.53	I	500	5026.24	I	800	6085.23	I
200	3893.22	I	400	4542.09	I	300	5026.79	I	300	6099.39	I
600	3899.83	I	400	4552.20	I	150	5027.89	I	500 c	6102.96	I
300	3919.38	I	800	4552.85	I	80	5032.45	I	1000	6120.68	I
300 c	3923.66	I	1000	4557.05	I	300	5055.27	I	1000	6130.80	I
200	3927.57	I	2000	4564.54	I	60	5058.33	I	150 c	6132.23	I
200	3933.70	I	1000	4578.45	I	500	5060.69	I	100	6184.70	I
4000 c	3946.57	I	1000	4593.35	I	80	5090.74	I	800	6192.66	I
2000	3947.09	I	300 c	4609.16	I	5000	5096.28	I	600 c	6244.18	I
200	3955.73	I	1000	4616.86	I	200 c	5103.24	I	100	6312.18	I
300	3979.64	I	200 c	4622.69	I	500	5104.32	I	100	6354.86	I
500	3980.35	I	300	4624.96	I	200	5109.81	I	100	6356.73	I
10000 c	3984.97	I	1000	4630.57	I	100	5120.60	I	80	6389.87	I
400	3987.78	I	200	4633.15	I	500	5139.26	I	100	6408.83	I
300	3994.04	I	3000	4637.50	I	500	5150.63	I	1000	6455.90	I
2000	3994.51	I	500	4643.28	I	2000	5161.81	I	600 c	6461.93	I
200	3996.97	I	2000	4648.33	I	2000	5174.81	I	100	6470.27	I
300	4004.69	I	2000 c	4660.21	I	100	5206.56	I	200 c	6491.68	I
500	4007.14	I	2000	4669.30	I	200	5225.55	I	200	6526.82	I
1000	4012.00	I	400	4672.17	I	200 c	5260.22	I	150	6579.24	I
400	4016.68	I	200	4678.90	I	200 c	5261.44	I	500 c	6625.57	I
600	4017.22	I	400	4689.36	I	1000	5275.51	I	300 c	6673.66	I
2000	4020.76	I	300	4694.28	I	800	5285.07	I	100	6687.10	I
20000 c	4031.63	I	1000	4706.92	I	100	5305.31	I	80	6786.00	I
1000	4039.25	I	200	4714.22	I	400	5314.96	I	70	6798.63	I
200	4041.78	I	2000	4717.77	I	600	5320.20	I	60	6856.90	I
10000 c	4049.11	I	500 c	4719.02	I	200	5334.79	I	150	7002.37	I
500	4051.95	I	4000 c	4719.28	I	500 c	5353.48	I	100	7016.57	I
200	4053.18	I	200 c	4736.51	I	200	5356.63	I	500 c	7086.18	I
200 c	4056.08	I	10000	4740.61	I	300	5358.65	I	60	7093.12	I
400	4083.54	I	500	4749.61	I	200	5360.14	I	200	7141.28	I
10000	4088.71	I	1000	4752.72	I	500 h	5375.20	I	200 c	7157.62	I
200	4093.69	I	200	4762.36	I	150 c	5423.05	I	70	7256.08	I
15000	4095.67	I	4000	4771.54	I	200	5447.40	I	100	7322.38	I
1000	4110.22	I	200	4773.89	I	500 c	5451.90	I	80	7329.14	I
10000	4115.08	I	200	4783.92	I	100	5455.95	I	100	7396.80	I
600	4119.27	I	500	4785.60	I	300	5471.96	I	100 c	7402.61	I
8000	4124.22	I	200 c	4790.48	I	70	5483.01	I	200	7405.36	I
1000	4128.27	I	250	4791.62	I	60	5485.37	I	60	7427.15	I
300	4134.81	I	300	4799.98	I	80 c	5506.89	I	150	7434.12	I
300	4139.12	I	100	4805.69	I	150	5524.11	I	600	7452.49	I
800	4139.85	I	100	4809.42	I	100	5528.23	I	60	7461.59	I
400	4141.27	I	500	4816.79	I	200	5541.94	I	80	7534.95	I
6000	4144.95	I	10000	4820.74	I	80	5543.63	I	800	7540.26	I
3000	4145.08	I	300	4831.35	I	100	5550.53	I	80	7543.39	I
200	4147.62	I	1000	4834.37	I	3000 c	5589.02	I	200	7574.02	I
10000	4165.61	I	1000	4835.39	I	200	5602.23	I	500	7579.26	I
500	4167.42	I	100	4841.36	I	2000 c	5620.45	I	90	7624.53	I
1000	4169.68	I	20000	4853.59	I	300	5629.94	I	100	7684.45	I
4000	4170.27	I	100	4857.21	I	1500	5642.13	I	500	7697.37	I
5000	4172.53	I	100 c	4862.19	I	800	5644.94	I	80 c	7698.19	I
1000	4176.28	I	10000	4866.73	I	100	5656.00	I	800 c	7793.04	I
800	4186.51	I	200	4870.77	I	60	5672.15	I	60	7798.28	I
300	4218.61	I	100	4888.70	I	200	5687.30	I	60	7816.74	I
10000 c	4238.19	I	150 c	4890.88	I	200	5689.05	I	800	7817.72	I
20000	4262.27	I	8000	4891.92	I	700	5725.31	I	100	7856.38	I
1000	4262.69	I	150	4892.49	I	500 c	5771.47	I	200	7861.44	I
800	4274.97	II	1000	4908.51	I	100	5794.65	I	400 d	7871.25	I
800	4278.90	I	2000	4909.57	I	80 c	5799.85	I	60 c	7874.76	I
30000	4297.06	I	500	4913.02	I	100 c	5814.24	I	70	7965.45	I
400 c	4336.86	I	150 c	4914.70	I	200	5831.48	I	500	7999.73	I
400	4358.49	I	200 c	4920.67	I	150 c	5836.33	I	200	8126.55	I
200	4359.26	I	300	4923.60	I	150	5923.36	I	200	8170.55	I
1000	4429.59	I	400	4948.06	I	1000 c	5924.47	I	150	8205.27	I
1000	4481.53	I	5000	4976.34	I	200	5926.29	I	100	8206.49	I
3000	4487.06	I	400	4995.00	I	600 c	5931.93	I	150	8211.31	I
400	4495.03	I	200	5002.67	I	60	6032.36	I	500 c	8237.08	I

Tc I and II

Intensity	Wavelength	
200	8308.15	I
200	8309.16	I
60	8315.50	I
100	8531.06	I
100	8543.61	I
100 c	8707.21	I
100 c	8737.93	I
200 c	8829.82	I

TELLURIUM (Te)

Z = 52

Te I and II

Refs. 1,344,345,346,347 - C.H.C.

Vacuum

6	799.60	II
8	802.28	II
6	942.62	II
6	1003.73	II
6	1007.80	II
5	1014.27	II
5	1022.79	II
6	1057.00	II
8	1059.51	II
6	1068.86	II
8	1077.66	II
6	1090.11	II
6	1144.04	II
5	1153.10	II
10	1161.42	II
10	1174.34	II
12	1175.79	II
9	1208.54	II
5	1213.00	II
9	1220.98	II
9	1253.62	II
9	1270.52	II
7	1274.76	II
8	1306.53	II
10	1324.92	II
7	1336.42	II
7	1345.20	II
9	1363.24	II
8	1366.73	II
10	1374.80	II
6	1395.22	II
6	1439.52	II
6	1465.25	II
7	1489.56	II
8	1607.99	II
10	1608.41	II
10	1613.15	II
6	1638.91	II
5	1655.4	I
5	1688.5	I
6	1700.0	I
6	1701.58	II
5	1708.0	I
6	1751.0	I
5	1759.4	I
5	1775.0	I
6	1795.7	I
6	1796.3	I
10	1822.4	I
6	1825.5	I
6	1850.6	I
6	1852.1	I

Te I and II

Intensity	Wavelength	
6	1853.8	I
8	1857.2	I
6	1860.4	I
3	1962.88	II
7	1994.83	I
	Air	
6	2000.2	I
26000	2002.02	I
8	2070.9	I
6500	2081.16	I
18000	2142.81	I
3200	2147.25	I
360	2159.85	I
9	2208.74	I
10	2255.49	I
500	2259.02	I
10	2265.52	I
20	2373.06	II
1200	2383.26	I
1500	2385.78	I
20	2387.82	II
10	2401.63	II
10	2436.47	II
50	2438.69	II
120	2530.72	I
20	2567.82	II
10	2574.96	II
5	2576.10	II
7	2579.24	II
10	2591.12	II
10	2592.85	II
10	2605.72	II
5	2621.92	II
10	2624.86	II
20	2627.96	II
20	2641.89	II
20	2648.48	II
100	2649.66	II
40	2657.70	II
80	2661.10	II
110	2677.13	I
20	2711.58	II
6	2769.65	I
10	2841.17	II
10	2846.15	II
100	2858.29	II
20	2861.00	II
40	2868.82	II
150	2895.41	II
30	2919.89	II
50	2942.11	II
50	2946.68	II
70	2967.29	II
20	2973.67	II
50	2975.90	II
15	2997.04	II
15	3012.02	II
50	3017.58	II
20	3023.31	II
70	3047.00	II
20	3052.46	II
10	3063.16	II
15	3073.56	II
8	3104.44	II
10	3132.58	II
20	3160.66	II
100	3175.14	I
10	3189.83	II
5	3211.21	II

Te I and II

Intensity	Wavelength	
60	3256.80	II
30	3268.77	II
30	3282.63	II
40	3321.92	II
40	3323.11	II
60	3329.22	II
60	3352.10	II
60	3362.79	II
25	3374.10	II
150	3406.79	II
20	3419.63	II
50	3442.25	II
40	3455.12	II
20	3456.88	II
20	3480.32	II
40	3483.67	II
20	3486.11	II
50	3521.11	II
50	3552.19	II
100	3611.78	II
50	3617.57	II
40	3644.46	II
20	3679.26	II
30	3725.66	II
40	3797.22	II
20	3800.92	II
20	3905.67	II
20	3918.54	II
30	3931.49	II
20	3947.98	II
40	3969.22	II
25	3975.94	II
20	3981.77	II
50	4006.52	II
20	4011.69	II
30	4029.73	II
40	4047.17	II
30	4048.88	II
15	4073.48	II
30	4101.04	II
70	4127.32	II
30	4163.55	II
100	4169.77	II
30	4179.29	II
25	4211.31	II
80	4225.73	II
30	4246.47	II
20	4251.15	II
100	4261.11	II
30	4264.36	II
60	4273.43	II
80	4285.85	II
40	4320.90	II
30	4361.28	II
150	4364.00	II
30	4377.12	II
75	4385.10	II
60	4396.00	II
170	4478.63	II
80	4537.07	II
100	4557.78	II
70	4630.62	II
100	4641.12	II
180	4654.37	II
200	4686.91	II
100	4696.38	II
100	4706.53	II
100	4766.05	II
70	4771.56	II

Te I and II

Intensity	Wavelength	
100	4784.87	II
100	4827.14	II
150	4831.28	II
150	4842.90	II
130	4865.12	II
200	4866.24	II
80	4885.22	II
80	4904.44	II
60	4961.88	II
60	5000.82	II
8	5083.0	I
7	5148.7	I
50	5449.84	II
50	5487.95	II
150	5576.35	II
150	5649.26	II
100	5666.20	II
200	5708.12	II
7	5733.5	I
150	5755.85	II
8	5789.1	I
50	5936.15	II
100	5974.68	II
8 d	6273.5	I
8 h	6349.7	I
50	6367.13	II
8	6405.9	I
7 h	6456.7	I
8 h	6613.4	I
10	6648.58	II
8	6660.2	I
8 h	6690.0	I
10 h	6790.0	I
20 h	6837.6	I
20 h	6854.7	I
10	7016.06	II
10	7039.13	II
15 h	7191.1	I
10	7236.62	II
20 h	7263.5	I
8	7280.9	I
10	7289.26	II
10	7445.39	II
12	7460.98	II
15	7468.75	II
10	7481.26	II
10	7556.8	I
6	7688.61	II
15	7759.1	I
8	7818.79	II
8	7861.61	II
15	7921.69	II
15	7943.14	II
10	7950.34	II
20	7972.9	I
6	8056.15	II
30 h	8061.4	I
10 h	8082.5	I
10	8122.44	II
8	8130.39	II
8	8154.47	II
20	8186.44	II
6	8190.94	II
10	8251.5	I
15	8273.53	II
10	8276.6	I
10	8291.1	I
15	8355.8	I
10	8372.12	II

Te I and II		
Intensity	Wavelength	
7	8469.8	I
8	8492.2	I
8	8500.8	I
12	8521.4	I
10	8535.68	II
12	8575.78	II
10	8604.63	II
8	8621.68	II
7 h	8632.1	I
15	8672.95	II
12	8701.09	I
10	8733.81	II
205	8758.18	I
12	8831.52	I
18	8851.15	I
6	8897.92	II
81	9004.37	I
18	9043.39	I
12	9196.80	I
15	9206.78	I
17	9207.64	I
12	9469.00	I
5660	9722.74	I
185	9785.54	I
109	9842.30	I
532	9868.92	I
118	9902.61	I
689	9956.30	I
37	9959.93	I
325	9977.13	I
136	9979.31	I
45	9985.85	I
5950	10051.41	I
4097	10091.01	I
104	10099.57	I
279	10106.05	I
381	10118.08	I
296	10151.06	I
397	10300.56	I
205	10323.05	I
745	10493.57	I
197	10509.86	I
1880	10918.34	I
298	11007.80	I
10200	11089.56	I
508	11163.74	I
6620	11487.23	I
280	11978.96	I
188	12566.24	I
389	12589.19	I
161	12805.50	I
400	13104.18	I
1580	13247.75	I
483	13316.63	I
217	14037.09	I
144	14072.53	I
434	14335.74	I
220	14417.46	I
1050	14513.51	I
129	14554.68	I
1480	15452.45	I
2430	15546.23	I
3760	16403.90	I
1960	17303.54	I
2780	18291.59	I
394	18777.30	I
269	19623.52	I
239	20147.54	I
1020	21043.73	I

Te I and II		
Intensity	Wavelength	
464	21602.50	I
37	21799.64	I
74	22555.29	I
48	22755.66	I
27	23294.94	I
17	23978.70	I
25	24059.04	I
13	26428.62	I
38	26539.17	I
15	26553.74	I
7	27179.26	I

TERBIUM (Tb)

Z = 65

Tb I and II
Ref. 1 – C.H.C.
Air

29	2577.73	II
110	2584.61	II
29	2590.31	II
29	2591.42	II
24	2592.64	II
55	2597.71	II
40	2602.93	II
110	2608.57	II
40	2616.90	
130	2628.69	II
55	2655.96	II
50	2661.40	II
24	2661.64	II
55	2667.64	II
50	2668.86	II
140	2669.29	II
40	2674.13	II
40	2674.69	II
29	2678.15	II
40	2683.97	II
35	2687.82	II
50	2691.90	II
35	2693.05	II
55	2693.41	II
35	2695.46	II
50	2696.83	II
190	2704.07	II
130	2736.24	II
160	2759.47	II
270	2769.53	II
130	2784.49	II
180	2800.51	II
250	2802.75	II
250	2809.30	II
180	2812.64	II
190	2852.14	II
110	2857.68	II
230	2886.29	II
160	2894.45	II
320	2897.44	II
160	2898.86	II
110	2901.54	II
110	2910.30	II
160	2914.75	II
160	2915.30	II
190	2915.60	II
120	2916.24	II
120	2918.89	II
120	2924.16	II
120	2924.53	II

Tb I and II		
Intensity	Wavelength	
160	2932.89	II
150	2940.05	II
250	2956.21	II
170	2968.87	II
170	2977.78	II
110	2987.03	II
110	2988.57	II
130	2996.00	II
110	2999.03	II
130	3005.52	II
170	3009.30	II
230	3010.59	II
230	3016.18	II
130	3019.17	II
170	3020.29	II
110	3023.43	II
170	3027.33	II
230	3031.60	II
230	3044.96	II
190	3051.13	II
130	3053.24	II
460	3053.55	II
130	3062.78	II
230	3064.09	II
110	3065.69	II
230	3067.20	II
270	3069.03	II
460	3070.05	II
270	3072.60	II
670	3078.86	II
480	3082.36	II
120	3086.78	II
250	3088.43	II
480	3089.58	II
230	3102.54	II
480	3102.96	II
290	3117.89	II
290	3119.62	II
230	3121.94	II
230	3123.05	II
160	3124.54	II
110	3131.35	II
250	3134.26	II
440	3139.64	II
190	3140.06	II
230	3145.22	II
150	3146.67	II
310	3147.04	II
310	3147.15	II
310	3148.71	II
120	3155.62	II
130	3162.42	II
290	3162.93	II
190	3165.74	II
380	3167.52	II
140	3168.32	II
230	3169.84	II
190	3173.76	II
380	3174.66	II
380	3180.54	II
140	3183.88	II
480	3187.26	II
290	3188.03	II
190	3194.69	II
380	3195.60	II
480	3199.56	II
1100	3218.93	II
1200	3219.98	II
250	3230.03	II

Tb I and II		
Intensity	Wavelength	
250	3231.06	II
210 d	3239.60	II
250	3240.00	II
480	3252.32	II
250	3262.97	II
230 d	3263.87	II
230	3264.90	II
400	3266.40	II
250	3274.14	II
250	3274.33	II
210	3277.32	II
760	3280.31	II
760	3281.40	II
520	3283.10	II
1000	3285.04	II
310	3287.55	II
310	3291.56	II
1500	3293.07	II
210	3295.33	II
310	3298.66	II
210	3304.95	II
420 d	3307.44	II
210	3308.51	II
210	3314.38	II
340 d	3321.15	II
420	3322.28	II
210	3323.38	II
210	3323.89	II
3800	3324.40	II
520	3329.08	II
210	3334.48	II
250	3336.70	II
310	3338.03	II
250	3339.00	II
210	3347.27	II
210	3348.07	II
760	3349.42	II
320	3362.25	II
760	3364.93	II
230 d	3370.61	II
320	3371.50	II
520	3372.36	II
460 d	3372.72	II
520	3375.03	II
320	3378.73	II
520	3378.86	II
320	3382.80	II
210	3390.60	II
380	3391.28	II
270	3398.35	II
320	3399.10	II
270	3400.53	II
210 d	3400.86	II
420	3402.33	II
210	3410.40	II
210	3410.68	II
520	3413.76	II
270	3416.24	II
400 d	3420.34	II
210	3430.61	II
320	3433.26	II
270	3439.72	II
520	3440.37	II
320	3444.58	II
210	3446.40	II
270	3449.46	II
810	3454.06	II
380	3460.38	II
230 d	3462.97	II

Tb I and II			Tb I and II			Tb I and II			Tb I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
620	3468.03	II	4700	3702.86	II	870	4032.28	I	870	4336.43	I
270	3471.73	II	300	3703.12	I	2100	4033.03	II	600	4337.64	I
270	3472.37	II	2400	3703.92	II	350	4036.22	I	1700	4338.41	I
810 d	3472.79	II	370	3709.30	II	210	4038.86	I	700	4340.62	I
210	3473.00	II	1000 d	3711.76	II	300	4051.86	II	430cw	4342.53	I
380	3480.17	II	300	3719.45	II	300	4052.87	II	430 d	4353.20	II
230	3483.04	II	650	3729.91	II	430	4054.12	I	280	4356.09	I
230	3483.69	II	430	3732.39	II	410	4060.37	I	870	4356.81	I
290 d	3489.51	II	430	3743.09		220	4060.87	II	280	4360.16	I
210 d	3492.00	II	650	3745.04	I	1300	4061.58	I	220	4367.30	II
270	3494.21	II	870	3747.17	II	220	4063.89	II	220	4372.02	I
270	3495.36	II	870	3747.34	II	390	4066.22	II	330	4382.45	I
810	3500.84	II	1100	3755.24	II	260	4075.22	I	300	4388.23	I
570	3507.45	II	430	3757.44	II	390	4081.24	I	260	4390.91	I
5700	3509.17	II	430 d	3757.90	II	210	4086.60	I	200	4416.27	II
380	3510.10	II	650	3759.35	I	210	4092.19	I	140	4420.19	I
320	3513.10	II	350	3761.14	I	260	4094.37	II	350	4423.10	I
570	3519.76	II	1700	3765.14	I	260	4094.49	I	110	4432.72	I
1300	3523.66	II	2100	3776.49	II	260	4103.90	II	240	4436.12	I
380	3525.14	II	330	3779.22		650	4105.37	I	110	4439.38	I
440	3525.61	II	600	3783.53	I	300	4112.50	I	240	4448.04	I
440	3536.32	II	410 d	3787.22	II	260	4119.92	I	110	4467.69	I
570	3537.94	II	410	3789.92	I	280	4143.51	I	430	4493.07	I
1100	3540.24	II	390	3792.20	I	1100	4144.41	II	45 d	4509.04	II
810	3543.89	II	600	3793.55		350	4158.53	I	150 h	4511.52	I
310 d	3551.03		330	3801.80	II	240	4169.09	I	45	4512.96	II
320	3551.96	II	760 d	3806.85	II	240	4169.32	I	75	4514.31	II
460 d	3558.77		1500	3830.26	I	240	4171.05	I	45	4519.72	II
3200	3561.74	II	540	3833.42	I	240	4172.60	I	45	4525.01	II
480	3562.90	II	920 d	3842.50	II	240	4172.82	I	45	4529.76	
570	3565.74		370 d	3845.61	II	260	4173.47	I	45 h	4531.83	II
810	3567.35	II	3700	3848.73	II	240	4186.21	I	45	4534.13	I
4200	3568.52	II	450 d	3869.75	II	300	4187.16	I	45	4537.14	I
1600	3568.98	II	3500 w	3874.17	II	390	4196.74	I	45	4537.23	I
320	3572.07	II	330	3883.34	I	450	4201.00	II	110	4549.07	I
1100	3579.20	II	480	3888.22	I	650	4203.74	I	45	4549.72	II
710	3585.03	II	490	3894.64	I	600	4206.49	I	110	4550.45	I
570	3587.44	II	330	3895.99	I	300cw	4213.50	I	110	4556.46	I
810	3596.38	II	330	3896.58	II	300	4214.42	II	55	4562.24	II
440	3598.06	II	330	3897.89	I	480	4215.09	I	110	4563.69	II
1600	3600.44	II	2400	3899.20	II	300	4217.56	I	30	4564.85	II
320	3604.90	II	1600	3901.33	I	260	4219.16	I	55	4573.19	II
320	3611.33	II	480	3908.06	I	260	4224.28	I	210	4578.69	II
320	3614.63	II	380	3909.14	I	480cw	4226.45	II	65	4584.84	II
320 d	3615.66	II	330	3909.55	I	260	4231.89	I	65	4591.56	II
320	3616.58	II	650	3915.43	I	480	4232.82	I	45	4592.38	I
380	3617.86	II	480	3919.52	II	300	4235.35	I	45 h	4604.10	II
380	3619.73	II	300	3922.10	II	370	4255.24	I	30	4611.96	I
810	3625.54	II	480	3922.74	II	480	4258.23	II	45 h	4615.92	II
570	3626.50	II	760	3925.45	II	260	4263.66	I	27	4617.49	I
380	3629.44	II	650	3935.24	II	650	4266.34	I	30	4619.36	II
670	3633.29	II	810 d	3939.52	II	330	4269.69	I	75 d	4626.32	II
670	3638.46	II	650	3946.89	II	220	4275.21	I	95	4626.94	II
670	3641.66	II	350 d	3958.36	II	760cw	4278.52	II	65	4632.07	I
440	3647.06	II	2200 d	3976.84	II	300	4285.13	II	65 h	4636.59	I
570	3647.75	II	1800	3981.87	II	300	4289.70	I	30	4636.99	II
2300	3650.40	II	300	3983.85	II	370	4298.36	I	85	4641.00	II
810	3654.88	II	350	3999.40	II	300	4299.90	I	210	4641.98	II
2000	3658.88	II	350 d	4002.19	II	240	4302.95	I	260cw	4645.31	II
450	3663.12	II	970	4002.59	II	240	4307.18	I	80	4647.23	I
3800	3676.35	II	1900	4005.47	II	450	4310.42	I	60	4658.38	I
300	3677.89	II	300	4010.04	I	300	4311.56	I	20	4658.73	
810	3682.26	II	760	4012.75	II	370	4313.25	I	80	4662.79	I
320	3688.15	II	330	4013.26	I	2200	4318.83	I	50 c	4665.45	I
610	3691.15	II	370	4019.14	II	600	4322.23	I	40	4669.40	I
300	3692.95	II	540	4020.47	II	600	4325.83	II	80	4676.90	I
450	3693.58	I	220	4022.88	I	3000	4326.43	I	70 c	4681.87	I
320	3696.85	II	370	4024.77	I	240	4328.90	I	50	4682.52	I
450	3700.12	I	520	4031.66	II	600	4332.12	I	25 c	4682.79	II

Tb I and II		
Intensity	Wavelength	
80	4688.63	II
80	4693.11	II
30 h	4693.39	II
200	4702.41	II
110	4707.94	II
40 w	4716.07	II
40	4728.16	II
60cw	4734.20	I
80	4739.93	I
70	4747.80	I
410cw	4752.53	II
40	4758.44	II
40	4760.19	II
30	4762.37	II
25	4764.47	II
35	4778.36	II
35	4778.80	II
180	4786.78	I
40cw	4789.91	II
30	4801.87	II
100	4813.77	I
60	4837.59	II
25	4840.39	I
30 c	4842.69	II
30	4844.89	II
30	4854.81	I
20	4856.54	II
30	4858.87	II
80	4875.57	II
25	4876.12	II
80	4881.15	II
29	4894.33	
95	4915.90	I
35	4924.09	I
35	4926.83	I
50	4928.93	I
65	4931.79	I
29	4970.99	II
29	4971.42	I
29	4973.04	I
29	4980.16	II
29	4980.56	I
85	4993.82	II
50	4995.84	II
55	4997.95	I
29	5006.10	II
50	5022.16	I
29	5024.24	II
29	5024.65	I
50	5033.12	I
50 w	5042.06	II
55	5054.30	I
55	5065.79	I
110	5078.25	I
24	5080.05	II
24	5081.11	I
75	5089.12	II
24	5089.66	I
24	5101.09	I
24	5108.56	I
35	5118.39	I
24	5120.18	I
50 w	5131.69	I
50 w	5141.08	II
50	5147.58	I
24	5164.27	I
29	5170.13	I
24	5170.61	I
50	5176.51	I

Tb I and II		
Intensity	Wavelength	
50	5179.97	I
50	5184.59	I
85	5186.13	I
50	5188.48	I
50	5198.86	I
35 w	5202.77	I
40	5204.55	I
40	5207.97	I
40	5214.28	I
40	5221.99	I
120	5228.12	I
40	5235.11	I
75	5248.71	I
75 w	5262.11	II
24	5275.03	I
75	5281.05	I
65	5304.72	I
29	5308.19	I
29	5309.46	I
110	5319.23	I
35	5331.04	I
65 w	5337.90	I
35 d	5338.59	I
24	5347.83	II
160	5354.88	I
75	5369.72	I
75	5375.98	I
29 d	5402.06	II
29	5413.65	I
29	5416.20	I
50	5424.10	II
29 c	5426.43	I
35	5443.38	I
29	5457.00	I
55	5459.81	I
29 w	5470.34	II
24	5481.45	I
55	5509.61	I
50	5514.54	I
65	5524.12	I
24 c	5525.62	I
35	5565.93	I
29 c	5638.80	I
29 c	5685.74	II
40 c	5686.48	I
85 c	5747.58	I
24	5762.66	I
24	5785.18	II
75	5795.64	I
75	5803.13	II
65	5815.36	I
29	5842.97	I
65	5851.07	I
65	5870.62	I
35	5898.84	I
24	5902.40	I
35	5904.71	I
65 c	5920.78	I
50 c	5939.38	I
35	5940.17	I
24	5951.17	I
75	5967.34	II
29	6038.97	I
29	6039.38	I
24	6104.29	II
24 c	6292.43	I
35	6331.68	II
24	6334.91	II
24	6446.87	II

Tb I and II		
Intensity	Wavelength	
35cw	6518.68	I
24 c	6574.04	II
35	6581.82	I
30	6607.17	II
90	6677.94	II
40cw	6702.61	I
20 c	6706.79	II
30	6785.12	II
130	6794.58	II
40	6874.18	II
55	6896.37	II
45 h	6899.95	I
40	6901.98	I
9	7005.99	II
17	7082.85	II
11	7089.22	II
11	7112.69	I
10	7187.48	I
10 h	7195.89	II
65	7204.28	I
19 h	7234.98	I
40	7257.73	I
17	7311.57	I
45	7348.88	II
10	7398.27	II
15 h	7424.24	II
10 h	7429.62	II
9	7472.15	I
22	7484.54	I
9	7495.45	I
45	7496.12	I
17	7499.69	II
27	7511.40	I
9	7519.77	II
6	7557.59	II
27 h	7582.03	II
27	7587.49	I
45	7590.24	I
65	7596.44	I
17 h	7601.18	II
17	7616.01	II
22 h	7624.05	I
30	7627.81	I
9 h	7639.05	II
8	7672.72	II
8 h	7694.74	II
22 h	7706.16	II
22 h	7726.97	II
30	7737.63	I
22	7793.20	I
8	7807.33	II
16	7832.91	II
30	7855.79	II
15	7864.99	I
6 h	7885.70	I
6	7913.11	I
27	7927.90	II
13	7955.31	I
11	7998.03	I
17	8001.04	I
13 h	8010.16	II
30	8025.42	II
6	8053.80	I
19	8067.35	II
30	8085.06	II
27	8164.17	I
13	8171.70	I
65	8194.82	II
95	8212.57	I

Tb I and II		
Intensity	Wavelength	
11	8214.33	I
8	8259.08	I
40	8450.06	II
8 h	8465.80	II
13	8502.70	I
30 h	8511.80	I
45	8583.45	II
30	8603.40	I
9	8678.25	I
65	8765.74	II

Tb IV
Ref. 302 - J.R.
Vacuum

30	1176.58	IV
30	1192.01	IV
70	1200.58	IV
50	1213.94	IV
80	1221.22	IV
500	1235.04	IV
1000	1259.40	IV
300	1301.48	IV
300	1308.30	IV
600	1311.70	IV
700	1315.12	IV
500	1325.56	IV
1000	1327.67	IV
100	1367.56	IV
400	1367.71	IV
700	1369.64	IV
1000	1373.86	IV
400	1376.46	IV
200	1378.23	IV
300	1381.00	IV
100	1382.83	IV
20	1389.92	IV
200	1516.17	IV
50	1530.10	IV
5000	1595.39	IV
2000	1633.19	IV
300	1649.38	IV
400	1654.75	IV
400	1667.58	IV
200	1672.55	IV
400	1681.98	IV
5	1684.46	IV
100	1685.37	IV
400	1691.95	IV
10	1695.23	IV
300	1698.36	IV
30	1701.60	IV
50	1704.79	IV
20	1705.05	IV
3	1943.94	IV
50	1970.90	IV

Air

2000	2027.79	IV
200	2029.22	IV
400	2048.88	IV
200	2078.83	IV
1000	2089.98	IV
1000	2332.54	IV
100	2436.01	IV

THALLIUM (Tl)

Z = 81

Tl I and II
Refs. 1,195,348,354
- C.H.C.

Tl I and II

Intensity	Wavelength	
	Vacuum	
3	650.90	II
5 r	670.87	II
4	674.10	II
15 r	696.30	II
5 r	709.23	II
10 r	817.18	II
5 r	836.34	II
8 r	1018.85	II
10 r	1049.73	II
8 r	1050.30	II
5 r	1074.97	II
10 r	1130.17	II
15 r	1162.55	II
10 r	1167.43	II
10 r	1183.41	II
12 r	1194.84	II
8	1231.81	II
5 r	1246.00	II
15 r	1307.50	II
8 r	1310.20	II
25 r	1321.71	II
8 r	1330.40	II
10 r	1373.52	II
1	1423.2	I
8 r	1489.65	I
5	1490.50	II
10 r	1499.30	II
10 r	1507.82	II
15 r	1561.58	II
10 r	1568.57	II
7 r	1593.26	II
5 h	1616.	I
1	1650.2	I
5	1685.40	I
1	1728.	I
10 r	1792.76	II
12 r	1814.85	II
3 h	1847.	I
8	1892.72	II
25 r	1908.64	II
	Air	
100 r	2007.56	I
2	2209.75	I
100 r	2210.71	I
3	2287.6	I
30	2298.04	II
140	2315.98	I
900 h	2379.69	I
8	2451.83	II
6	2469.03	II
1	2508.2	I
20	2530.86	II
700	2580.14	I
60	2608.99	I
80	2665.57	I
420	2709.23	I
50 h	2710.67	I
4400 d	2767.87	I
280	2826.16	I
10	2849.80	II
2800	2918.32	I
440	2921.52	I
5	3029.01	II
20	3091.56	II
15	3185.51	II
15	3186.56	II
15	3187.74	II

Tl I and II

Intensity	Wavelength	
1200	3229.75	I
15	3291.01	II
12	3319.91	II
12	3321.04	II
8	3322.25	II
15	3369.15	II
8	3381.00	II
6	3381.80	II
6 d	3460.48	II
20000	3519.24	I
5000	3529.43	I
8	3540.08	II
9	3560.68	II
5	3567.67	II
12000cw	3775.72	I
8	3793.95	II
10	3832.30	II
6	3869.15	II
10	3887.15	II
8	4223.05	II
20	4274.98	II
40	4306.80	II
2	4359.9	I
8	4490.77	II
20	4737.05	II
15	4981.35	II
25	5078.54	II
25	5152.14	II
6	5181.95	II
6	5183.10	II
18000	5350.46	I
15 d	5384.85	II
7	5409.92	II
10	5410.97	II
25	5949.48	II
10	6179.98	II
8 d	6239.03	II
10	6378.32	II
16 h	6549.84	I
6 h	6713.80	I
10	6966.5	II
3	7493.6	I
2	7678.93	I
10	7815.80	I
8	8130.0	I
20	8373.6	I
8	8445.8	II
10	8474.27	I
8	8632.9	II
10	8664.1	II
4	8850.4	I
5	8976.75	I
3	9038.4	I
20	9130.	II
20	9130.5	I
2 h	9183.1	I
4	9225.	II
2 h	9252.6	I
3	9254.	II
40	9509.4	I
10	9863.4	I
20	9930.4	I
2	9937.4	I
30	10011.9	I
40	10488.80	I
5	11101.61	I
4	11483.7	I
1000	11512.82	I
5	11592.9	I

Tl I and II

Intensity	Wavelength	
15	12491.8	I
150	12736.4	I
700	13013.2	I

Tl III

Ref. 355 - C.H.C.

	Vacuum	
7	1231.57	III
10	1266.33	III
4	1332.36	III
10	1477.14	III
4	1506.37	III
8	1558.67	III
8	1660.05	III
	Air	
6	3163.53	III
3	3300.80	III
9	3456.34	III
4	3507.41	III
6	3933.05	III
2	3946.02	III
7	4109.85	III
4	4155.75	III
6	4269.81	III
2	4380.57	III
4	5086.99	III
4	5362.40	III
2	5499.4	III
5	5927.8	III
4	8001.	III

Tl IV

Ref. 356 - C.H.C.

	Vacuum	
7	531.26	IV
10	570.49	IV
4	597.01	IV
1	868.99	IV
3	912.74	IV
8	917.31	IV
30	1028.69	IV
20	1034.73	IV
20	1036.61	IV
10	1049.48	IV
10	1057.56	IV
20	1068.04	IV
20	1070.47	IV
30	1079.68	IV
5	1079.70	IV
2	1092.90	IV
4	1094.41	IV
6	1099.60	IV
4	1125.52	IV
5	1139.30	IV
3	1144.07	IV
3	1225.45	IV
6	1273.03	IV
3	1304.55	IV
6	1323.66	IV
7	1337.10	IV
7	1358.56	IV
5	1374.62	IV
7	1377.75	IV
8	1404.60	IV
5	1412.93	IV
6	1434.72	IV
5	1449.37	IV
5	1883.2	IV
3	1974.6	IV

THORIUM (Th)

Z = 90

Th I and II

Refs. 1,97,98,434 - J.G.C. and R.Z.

Intensity	Wavelength	
	Air	
100	2326.926	II
190	2377.84	II
90	2404.504	II
100	2413.409	II
30	2439.433	I
5	2532.894	I
150	2547.901	II
500	2565.593	II
270	2566.588	II
200	2576.688	II
230	2589.059	II
230	2597.047	II
230	2600.882	II
100	2609.855	II
230	2618.91	II
270	2623.448	II
270	2625.737	II
55	2628.812	II
270	2641.488	II
170	2650.583	II
150	2658.663	II
50	2680.692	I
360	2684.288	II
480	2692.415	II
100	2695.553	II
270	2703.958	II
170	2708.176	II
230	2721.691	II
170	2722.380	II
250	2729.327	II
250	2732.808	II
28	2735.834	II
520	2747.156	II
100	2749.530	II
410	2752.166	II
130	2760.391	II
100	2765.123	II
270	2768.841	II
200	2770.816	II
70	2773.951	II
50	2774.066	II
70	2778.706	II
35	2791.496	I
90	2794.255	II
70	2797.737	II
55	2799.114	II
110	2807.827	II
180	2808.998	II
70	2814.319	II
45	2816.071	II
100	2819.322	II
100	2820.336	II
100	2822.025	II
170	2826.855	II
70	2830.442	II
800	2832.315	II
1200	2837.295	II
320	2842.812	II
100	2848.084	I
270	2851.260	II
50	2854.342	I
30	2860.490	I

Th I and II			Th I and II			Th I and II			Th I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
220	2861.42	II	370	3124.387	II	310	3386.501	II	150	3682.486	I
35	2868.461	I	480	3125.507	II	110	3387.920	I	50	3688.658	I
70	2869.916	II	150	3131.070	II	1300	3392.035	II	100	3690.624	I
550	2870.406	II	100	3136.216	I	200	3396.727	I	170	3692.566	I
30	2878.657	I	420	3139.306	II	250	3398.544	I	180	3698.105	I
40	2882.511	II	420	3142.835	II	200	3405.558	I	50	3703.229	I
320	2884.289	II	310	3146.044	II	250	3413.012	I	340	3706.767	I
360	2885.049	II	150	3150.455	II	50	3417.497	I	280	3711.305	II
360	2887.817	II	310	3154.300	II	390	3421.210	I	590	3719.435	I
40	2892.172	II	50	3157.221	I	270	3423.989	I	50	3719.836	I
250	2899.720	II	30	3161.364	I	50	3428.622	I	770	3721.825	II
45	2903.167	II	140	3166.099	II	980	3433.998	II	110	3727.902	I
50	2908.506	I	110	3169.328	II	770	3435.976	II	50	3733.672	I
200	2910.594	II	420	3175.726	II	340	3438.949	II	1300	3741.183	II
90	2911.320	II	270	3179.048	II	110	3442.578	I	310	3747.539	I
90	2912.009	II	1100	3180.193	II	50	3446.547	I	650	3752.569	II
140	2919.840	II	310	3184.948	II	130	3451.702	I	140	3757.694	I
250	2925.050	II	770	3188.233	II	50	3457.068	I	110	3765.240	I
250	2928.254	II	85	3191.221	II	340	3462.850	II	180	3770.056	I
50	2931.281	I	55	3192.585	I	130	3465.924	II	50	3772.649	I
55	2934.135	II	55	3195.689	I	390	3468.219	II	85	3776.271	I
100	2936.086	I	30	3202.520	I	1300	3469.920	II	50	3780.966	I
35	2940.589	II	170	3210.308	II	170	3471.218	I	340	3785.600	II
340	2942.860	II	55	3214.380	I	250	3479.173	II	100	3789.167	I
100	2943.729	I	560	3221.292	II	70	3480.052	I	85	3795.386	I
150	2949.068	II	30	3223.168	I	200	3486.552	I	50	3800.197	I
80	2950.438	II	560	3229.009	II	100	3489.184	I	590	3803.075	I
35	2955.849	II	110	3230.868	II	270	3493.518	II	50	3807.273	I
170	2957.580	II	480	3235.84	II	70	3496.810	I	340	3813.068	II
28	2959.853	I	590	3238.116	II	130	3498.621	I	50	3818.685	I
28	2963.607	I	240	3241.108	II	70	3503.786	I	75	3825.133	I
270	2968.686	II	110	3244.448	I	50	3506.645	I	450	3828.384	I
110	2971.481	II	280	3251.915	II	110	3511.157	I	70	3836.584	I
220	2974.011	II	910	3256.274	II	140	3518.404	I	840	3839.746	II
50	2976.104	I	180	3257.366	I	70	3521.059	I	280	3841.960	II
55	2980.334	II	910	3262.668	II	70	3526.633	I	100	3846.887	I
160	2985.243	II	180	3267.003	II	140	3531.450	I	85	3852.135	I
360	2988.232	II	110	3272.027	I	670	3539.587	II	390	3854.511	II
150	2991.062	II	30	3278.733	I	180	3544.018	I	140	3859.840	II
110	2996.986	II	50	3281.048	I	170	3549.595	I	450	3863.405	II
50	3002.686	I	130	3285.752	I	140	3551.401	I	100	3869.663	I
30	3004.248	I	620	3287.789	II	200	3555.013	I	210	3875.374	I
180	3008.497	II	910	3291.739	II	530	3559.451	II	140	3879.644	I
50	3010.736	I	620	3292.520	II	110	3563.375	I	100	3886.915	I
20	3018.644	I	240	3297.832	II	70	3569.820	I	340	3895.419	I
50	3021.056	I	240	3301.650	I	200	3576.557	I	50	3901.661	I
150	3026.575	II	480	3304.238	I	100	3583.101	I	110	3903.102	I
40	3030.487	I	130	3309.365	I	170	3589.750	I	170	3905.186	II
370	3034.065	II	50	3314.790	I	270	3592.780	I	50	3908.750	I
170	3035.110	II	30	3318.390	I	270	3598.120	I	85	3911.909	I
85	3038.598	II	510	3321.450	II	390	3601.034	II	50	3916.417	I
130	3045.564	II	390	3324.752	II	170	3608.377	I	110	3919.023	I
420	3049.092	II	840	3325.120	II	980	3609.445	II	140	3925.093	I
30	3056.692	I	55	3328.255	II	200	3612.427	I	590	3929.669	II
220	3061.699	II	250	3330.476	I	480	3615.133	II	200	3932.911	I
450	3067.729	II	620	3334.604	II	400	3617.118	II	140	3937.040	II
370	3072.114	II	620	3337.870	II	270	3623.970	II	50	3942.072	I
670	3078.828	II	30	3342.073	II	390	3625.627	II	50	3948.030	I
480	3080.217	II	180	3346.557	II	140	3632.831	I	200	3948.964	II
240	3088.470	II	310	3348.768	I	270	3635.943	I	50	3952.760	I
130	3090.093	II	980	3351.228	II	70	3638.644	I	110	3959.300	I
50	3093.711	I	310	3354.179	II	210	3642.248	I	390	3967.392	I
140	3097.266	II	620	3358.602	II	170	3649.735	I	200	3972.155	I
200	3102.664	II	75	3361.738	II	50	3658.808	I	150	3980.089	I
510	3108.296	II	390	3367.819	II	100	3659.629	I	110	3991.730	I
50	3115.538	I	250	3374.974	I	220	3663.202	I	530	3994.549	II
100	3116.263	I	390	3378.573	II	140	3668.140	I	50	3998.061	I
510	3119.526	II	130	3380.859	I	280	3669.968	I	240	4003.309	II
510	3122.963	II	310	3385.531	II	700	3675.567	II	250	4007.021	II

Th I and II			Th I and II			Th I and II			Th I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
220	4008.210	I	85	4342.256	II	20	4907.209	I	20	5399.175	I
220	4009.056	I	130	4344.326	II	240	4919.816	II	24	5417.486	I
280	4012.495	I	55	4349.072	I	18	4927.780	I	60	5425.678	II
4200	4019.129	II	55	4354.484	I	40	4939.642	I	50	5435.893	II
210	4025.656	II	85	4359.372	I	60	4947.575	II	40	5449.479	II
140	4027.009	I	85	4365.930	I	50	4954.659	II	30	5462.615	II
250	4030.842	I	85	4374.123	I	30	4965.731	I	15	5470.759	I
250	4036.047	I	1300	4381.860	II	35	4975.950	II	24	5484.147	II
240	4036.565	II	1100	4391.110	II	24	4985.372	I	10	5496.137	I
240	4041.204	II	55	4392.974	I	50	5002.097	I	19	5504.302	I
55	4048.287	I	55	4401.580	I	50	5002.097	I	35	5509.994	I
110	4050.887	I	85	4408.882	I	50	5015.889	II	12	5524.584	I
140	4059.253	I	210	4412.741	II	260	5017.255	II	50	5539.262	I
250	4063.407	I	28	4416.845	I	20	5029.892	I	70	5539.911	II
300	4069.201	II	50	4422.048	I	24	5039.230	I	35	5548.176	I
100	4069.461	I	250	4432.963	II	50	5044.719	I	50	5558.342	I
55	4075.503	I	140	4440.866	II	240	5049.796	II	60	5564.203	II
110	4081.368	I	25	4452.565	I	85	5055.347	II	40	5573.354	I
85	4085.434	I	85	4458.002	I	70	5058.562	II	60	5587.026	I
700	4086.520	II	220	4465.341	II	110	5067.974	I	24	5595.064	I
70	4088.726	I	30	4475.221	I	30	5081.446	I	50	5604.515	II
700	4094.747	II	75	4482.169	I	50	5090.051	I	35	5615.320	I
150	4100.341	I	50	4489.664	I	50	5098.043	II	7	5630.297	I
270	4105.330	II	110	4498.940	I	40	5101.130	I	70	5639.746	II
840	4108.421	II	55	4505.216	I	50	5110.867	II	7	5648.991	I
240	4112.754	I	280	4510.527	II	30	5115.044	I	12	5657.925	I
280	4115.758	I	70	4521.194	I	10	5125.950	I	15	5667.128	I
1100	4116.713	II	22	4530.319	I	20	5134.746	I	20	5677.053	I
30	4123.600	I	40	4535.255	I	95	5143.267	II	10	5685.192	I
200	4127.411	I	30	4545.915	II	120	5148.211	II	65	5700.918	II
110	4131.002	I	70	4555.812	I	50	5151.612	I	95	5707.103	II
340	4132.753	II	40	4563.660	I	50	5154.243	I	50	5720.183	I
200	4134.067	I	65	4570.972	I	85	5158.604	I	30	5732.975	II
220	4140.235	II	50	4588.426	I	70	5160.730	I	24	5742.084	II
250	4142.701	II	75	4595.421	I	20	5168.922	I	30	5749.388	II
200	4148.182	II	26	4612.554	II	50	5176.961	I	70	5760.551	I
450	4149.986	II	30	4621.163	I	35	5183.990	II	15	5773.946	I
110	4158.535	I	140	4631.761	II	50	5190.871	II	20	5789.645	I
140	4165.766	I	140	4631.761	II	50 h	5195.814	I	35	5804.141	I
620	4178.060	II	30	4641.254	I	50	5198.800	I	19	5815.422	II
250	4179.714	II	140	4651.558	II	95	5199.164	I	10	5832.370	I
30	4184.138	I	23	4663.202	I	50	5211.230	I	10	5845.919	I
130	4193.017	I	50	4669.984	I	95	5216.596	II	15	5854.121	I
620	4208.890	II	65	4676.056	I	50	5218.528	II	15	5868.373	I
130	4210.923	I	50	4686.195	I	35	5219.110	I	10	5878.933	I
28	4214.828	I	140	4694.091	II	110	5231.160	I	8	5891.451	I
55	4220.065	I	50	4703.990	I	85	5233.225	II	15	5899.844	I
55	4227.387	I	20	4712.841	I	85	5233.229	II	20	5914.387	II
30	4230.824	I	90	4723.438	I	95	5247.654	II	19	5925.893	II
85	4235.463	I	30	4729.128	I	10	5255.573	I	10	5937.162	I
20	4241.094	I	190	4740.529	II	35	5258.360	I	10	5944.648	I
30	4247.989	II	140	4752.414	II	12	5266.710	I	8	5957.587	I
110	4253.538	I	13	4766.600	I	70	5277.501	II	30	5973.665	I
70	4256.254	I	50	4778.294	I	15	5281.069	I	85	5989.044	II
110	4260.333	I	20	4786.531	I	10	5294.397	I	24	5994.129	I
28	4269.942	I	40	4789.387	I	30	5297.743	I	21	6007.072	I
280	4273.357	II	45	4808.134	I	30	5307.466	II	30	6015.426	II
480	4277.313	II	20	4819.193	I	35	5312.002	I	17	6021.036	I
700	4282.042	II	26	4822.855	I	20	5317.494	I	17	6037.698	I
28	4288.669	I	40	4826.700	I	60	5325.145	II	24	6044.431	II
55	4297.306	I	45	4831.121	I	50	5326.976	I	10	6053.381	I
85	4299.839	I	50	4840.843	I	20	5330.080	I	5	6061.536	I
100	4307.176	I	30	4848.362	I	60	5343.581	I	30	6077.106	I
200	4309.991	II	15	4852.868	I	14	5351.126	I	30	6087.262	II
55	4315.254	I	40	4858.333	II	30	5358.707	I	24	6099.083	I
110	4318.416	I	280	4863.163	II	20	5369.281	I	30	6104.580	I
30	4325.274	I	40	4872.917	I	30	5378.836	I	40	6112.837	I
28	4330.844	I	26	4878.733	I	70	5390.466	II	30	6120.557	II
130	4337.277	I	45	4894.955	I	50	5392.572	I	10	6124.480	I

Th I and II			Th I and II			Th I and II			Th I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
14	6151.993	I	20	6889.303	II	4	7658.324	I	8	8775.573	I
10	6161.354	I	3	6908.988	I	7	7676.219	I	4	8792.058	I
60	6169.822	I	24	6911.227	I	21	7685.305	I	3	8804.590	I
50	6182.622	I	5	6916.129	I	4	7710.269	I	5	8841.185	I
12	6191.906	I	5	6936.652	I	4	7728.951	I	18	8842.073	II
24	6193.858	II	35	6943.611	I	10	7731.72	II	15	8868.834	I
12	6203.493	I	5	6954.657	I	4	7771.948	I	4	8875.233	I
12	6224.528	I	15	6965.947	I	15	7787.79	II	2	8907.038	I
24 h	6234.856	I	3	6981.086	I	15	7788.937	I	5	8955.848	I
8	6240.954	I	55	6989.656	I	5	7798.360	I	15	8957.97	II
10	6257.424	I	24	6993.038	II	4	7810.625	I	40	8967.641	I
21	6261.063	I	18	7000.806	I	21	7817.771	I	3	8987.408	I
21	6261.418	I	18	7000.806	I	8	7834.459	II	5	9031.819	I
50	6274.116	II	3	7015.319	I	15	7847.540	I	25	9048.252	I
50	6274.117	II	10	7018.569	I	4	7864.023	I	5	9063.953	I
30	6279.172	II	3	7026.462	I	12	7865.95	I	6	9094.831	I
8	6291.192	I	7	7036.281	I	6	7886.284	I	3	9107.225	I
10	6303.251	II	30	7045.795	II	11	7900.31	I	2	9118.140	I
8	6317.185	I	15	7053.619	II	4	7937.732	I	3	9170.825	I
21	6327.278	I	6	7060.654	I	11	7941.72	I	10	9203.963	I
35	6342.860	I	24	7075.333	II	5	7954.594	I	10	9266.208	I
50	6355.911	II	30	7084.171	I	7	7972.598	I	10	9276.276	I
14	6369.140	I	24	7089.339	II	24	7978.974	I	10	9289.563	I
40	6376.931	I	10	7100.512	II	11	7987.97	I	4	9317.722	I
30	6411.899	I	3	7109.861	I	5	7993.680	I	7	9340.706	I
24	6413.615	I	11	7124.562	I	2	8014.502	I	15	9399.085	I
15	6437.762	I	3	7132.613	I	5	8024.253	II	10	9431.603	I
15	6450.005	I	5	7148.560	I	11	8032.433	I	15	9461.030	I
60	6457.283	I	10	7154.954	I	11	8062.64	I	15	9474.882	I
50	6462.614	I	30	7168.896	I	5	8085.220	I	15	9495.501	I
5	6466.717	I	15	7173.373	I	5	8093.626	I	15	9497.191	I
14	6490.738	I	40	7191.132	II	5	8129.407	I	10	9505.392	I
5	6501.992	I	7	7200.046	I	11	8138.477	I	10	9561.24	I
20	6512.364	I	35	7208.006	I	18	8143.139	I	8	9613.689	II
5	6522.044	I	11	7212.69	I	12	8159.729	I	12	9632.647	I
50 h	6531.342	I	10	7217.755	II	10	8163.125	II	10	9664.700	I
6	6554.160	I	11	7218.054	I	7	8169.788	I	4	9676.106	I
5	6558.876	I	3	7242.355	I	15	8186.914	I	15	9700.564	I
3	6565.070	I	5	7255.354	I	12	8203.199	II	15	9746.46	I
5	6577.215	I	3	7270.558	I	2	8231.408	I	10	9812.70	I
24	6583.907	I	7	7284.904	I	5	8252.395	I	10	9826.45	I
24	6588.540	I	5	7298.143	I	3	8259.512	I	20	9833.42	I
24	6593.940	I	11	7305.405	II	18	8275.629	I	15	10039.364	I
24	6605.416	II	5	7315.067	I	3	8292.529	I	15	10089.138	I
24	6619.946	II	7	7324.808	I	15	8320.857	I	15	10133.56	II
24	6619.947	II	5	7339.606	I	30	8330.451	I	15	10419.57	II
21	6644.650	II	8	7341.152	I	4	8358.726	I	15	10556.45	I
6	6658.678	II	5	7361.349	I	6	8387.104	II	15	10723.92	II
30	6662.269	I	5	7384.175	I	18	8403.767	II	20	10726.93	I
6	6674.697	I	18	7385.501	I	15	8416.729	I	20	10942.24	II
3	6683.367	I	3	7393.431	II	12	8421.227	I	15	11051.90	I
8	6692.724	II	5	7402.252	I	21	8446.509	I	30	11230.259	I
5	6697.712	I	3	7418.550	I	5	8464.230	I	20	11354.719	I
16	6727.459	I	21	7428.940	I	18	8478.360	I	15	11703.46	I
3	6735.126	I	10	7430.254	I	5	8510.621	I	15	11864.25	I
5	6742.884	I	3	7444.749	I	5	8516.557	I	15	11940.64	I
20	6756.453	I	2	7462.993	I	5	8539.795	I	20	11984.67	II
6	6765.677	I	10	7481.355	I	6	8554.946	I	15	12018.72	I
15	6778.313	I	2	7493.427	I	11	8573.122	I	20	12127.30	I
15	6780.413	I	50	7525.508	II	12	8591.838	I	20	12194.16	II
6	6791.236	I	7	7549.314	I	3	8621.325	I	15	12206.89	I
3	6798.747	I	18	7567.740	I	3	8638.363	I	20	12231.94	I
3	6809.511	I	12	7585.69	I	10	8665.487	I	15	12338.00	I
5	6823.509	I	12	7585.792	I	4	8668.116	I	15	12477.30	I
11	6829.036	I	4	7598.204	I	2	8701.127	I	20	12646.54	I
14	6834.925	I	2	7607.824	I	5	8709.236	I	15	12866.64	I
4	6862.873	I	5	7627.176	I	8	8732.401	II	15	12940.65	II
5	6866.367	I	3	7636.176	I	18	8748.033	I	15	12959.82	I
8	6874.754	I	30	7647.380	I	15	8758.244	I	15	13145.90	II

Th I and II

Intensity	Wavelength	
15	13565.67	I
15	14090.25	I
15	14168.67	I
15	14424.54	I
15	14618.98	I
15	14654.91	I
15	14940.49	II
15	15240.24	II
15	15429.78	I
15	15831.75	I
20	17208.22	II
15	17307.66	I
15	17381.91	I
15	17481.04	I
15	17584.52	I
15	17936.43	II
15	18811.88	I
15	19145.60	II
15	19338.98	II
10	19774.30	II
10	20634.36	I
10	20692.06	II
10	22264.35	II

Th III

Ref. 157 - J.G.C.

Vacuum

100	1888.12	III

Air

50	2149.18	III
50	2162.82	III
50	2199.74	III
50	2206.62	III
50	2291.59	III
100	2301.18	III
100	2319.52	III
80	2324.68	III
150	2335.50	III
100	2340.58	III
100	2363.06	III
50	2368.91	III
100	2371.42	III
80	2381.47	III
100	2391.48	III
200	2413.50	III
50	2424.54	III
200	2427.94	III
200	2431.68	III
200	2441.24	III
100	2463.66	III
50	2473.93	III
100	2501.08	III
60	2512.69	III
50	2514.31	III
100	4555.73	III
50	4589.28	III
100	5376.13	III
50	5447.18	III
50	6242.95	III
50	6599.39	III
50	7461.59	III
50	8105.14	III

Th IV

Refs. 156,165 - J.G.C.

Vacuum

4	797.53	IV
1	835.55	IV
30	846.91	IV
1	854.02	IV

Th IV

Intensity	Wavelength	
30	882.39	IV
12	886.66	IV
100	1565.85	IV
70	1682.22	IV
30	1684.01	IV
150	1707.37	IV
200	1959.02	IV

Air

200	2002.34	IV
100	2066.70	IV
20	2143.91	IV
30	2146.81	IV
1	2242.11	IV
2	2261.26	IV
5	2296.81	IV
100	2693.99	IV
2	4937.09	IV
4	4952.52	IV
3	5420.38	IV
2	6711.87	IV
3	6740.37	IV
50	6901.16	IV
	9839.25	IV
	10875.05	IV

THULIUM (Tm)

Z = 69

Tm I and II

Ref. 1 - C.H.C.

Air

360	2284.79	II
120	2329.77	II
70	2340.92	II
120	2363.91	II
45	2365.96	II
160	2367.11	II
150	2383.68	II
110	2388.95	II
450	2409.02	II
110	2412.44	II
120	2421.65	II
450	2426.17	II
140	2445.47	II
770	2480.13	II
150	2481.15	II
130	2487.52	II
250	2491.60	II
100	2499.54	II
130	2507.15	II
1300	2509.08	II
200	2520.87	II
250	2522.17	II
180	2524.11	II
130	2527.02	I
110	2527.42	II
120	2542.66	II
360	2552.76	I
540	2561.65	II
150	2563.86	II
430	2588.27	II
170 h	2596.49	I
110	2601.09	I
220	2606.02	II
810	2607.06	II
730	2624.33	II
210	2640.76	II
130	2646.45	II

Tm I and II

Intensity	Wavelength	
160	2650.27	II
190	2658.48	II
250	2660.09	II
140	2668.20	II
310	2679.57	II
170	2697.50	II
540	2721.19	II
200	2744.08	II
270	2779.55	II
350	2785.07	II
680	2794.60	II
730	2797.27	II
250	2818.47	II
250	2827.02	II
580	2827.92	II
200	2831.55	II
310	2844.67	II
200	2854.17	I
200	2860.12	II
200	2861.74	II
1600	2869.23	II
630	2890.94	II
210	2918.27	II
270	2925.65	II
680	2926.74	II
630	2935.99	II
350	2951.26	II
430	2965.86	II
490	2973.22	I
540	2981.48	II
350	2986.52	II
630	2990.54	II
200	2993.26	II
230	3013.71	II
430	3014.65	II
1500	3015.30	II
270	3017.09	II
330	3026.07	II
280	3042.35	II
340 d	3046.76	II
320	3050.73	II
340	3056.07	II
580	3073.08	II
360	3081.12	I
740	3098.60	II
7400	3131.26	II
2300	3133.89	II
230	3144.90	II
230	3146.16	II
1900	3151.04	II
1500	3157.34	II
450	3172.65	I
2300	3172.83	II
380	3173.58	II
230	3195.33	II
320	3210.56	II
320	3210.82	II
320	3212.01	II
230	3231.51	II
470	3235.44	II
1200	3236.81	II
1600	3240.23	II
2300	3241.54	II
320	3246.96	I
420	3247.46	II
1900	3258.05	II
400	3261.65	II
320	3264.10	II
1600	3266.64	II

Tm I and II

Intensity	Wavelength	
1200	3267.40	II
790	3268.99	II
1100	3276.81	II
1200	3283.40	II
1200	3285.61	II
2300	3291.00	II
2000	3302.46	II
210	3306.01	II
210	3306.91	II
210	3308.01	II
1200	3309.80	II
640	3310.59	II
400	3316.88	II
210	3318.65	II
230	3349.99	I
230	3354.86	II
4000	3362.61	II
490	3374.50	II
420 d	3384.99	II
1700	3397.50	II
420	3399.95	II
850	3410.05	I
340	3412.59	I
340	3416.59	I
6400	3425.08	II
950	3425.63	II
340	3429.33	I
850	3429.96	II
420	3431.19	II
4900	3441.50	II
4900	3453.66	II
8500	3462.20	II
210	3467.51	I
340	3476.69	I
340	3480.98	I
340	3481.75	II
420	3487.38	I
210	3492.58	II
340	3499.95	I
250	3513.02	II
250	3517.60	I
250	3534.85	II
1700	3535.52	II
490	3536.21	II
850	3536.58	II
420	3537.91	I
210	3555.82	I
420	3557.79	II
340	3560.92	I
420	3563.88	I
490	3565.91	II
1300	3566.47	II
420	3567.36	I
280	3574.06	II
280	3586.07	I
2100	3608.77	II
250	3609.53	II
380	3638.41	I
950	3643.65	II
240	3647.72	II
600	3653.61	II
500	3665.81	II
1100	3668.09	II
410	3677.98	II
450 d	3678.85	II
410	3694.74	II
4800	3700.26	II
3800	3701.36	II
330	3704.85	II

Tm I and II			Tm I and II			Tm I and II			Tm I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
7700	3717.91	I	40	4561.86	II	27	5065.88	I	35	5838.76	II
890	3725.06	II	80	4564.68	I	80	5066.67	I	240	5895.63	I
2400	3734.12	II	40	4567.11	II	27	5072.42	I	35	5899.47	I
5000	3744.06	I	95	4596.63	I	27	5076.36	I	24	5901.57	I
1700	3751.81	I	270	4599.02	I	27	5077.18	I	8	5912.58	I
310	3756.86	II	35	4601.29	II	35	5085.09	I	11	5931.70	I
6000	3761.33	II	55	4603.43	II	40	5107.53	I	27	5935.90	I
4800	3761.91	II	40	4604.85	I	95	5113.97	I	140	5971.26	I
260	3783.55	II	50	4613.97	I	50	5114.55	II	27	5975.02	I
380	3795.16	II	40	4614.47	II	22	5120.67	I	11	5984.87	I
7100	3795.75	II	300	4615.94	II	22	5140.28	II	19	6025.44	I
770	3798.54	I	35	4619.06	II	40	5149.40	II	11	6067.78	II
240	3798.75	II	40	4621.72	I	19	5182.68	I	16	6131.53	I
600	3807.72	I	80	4626.33	II	40	5185.25	I	14	6175.29	I
380	3810.72	II	95	4626.56	II	14	5204.51	II	14	6181.41	II
550	3817.39	II	40	4626.97	I	80	5213.38	I	14	6299.46	II
290	3826.39	I	110	4634.26	II	22	5228.23	II	27	6352.66	I
1300	3838.20	II	40	4642.96	II	14	5260.93	II	22	6401.44	I
290	3840.87	I	95	4643.12	I	24	5267.34	II	8	6430.94	II
8900	3848.02	II	35	4644.58	I	40	5291.14	I	14	6440.54	I
140	3857.84	II	120	4655.09	I	40	5294.32	I	200	6460.26	I
6800	3883.13	I	35	4666.70	II	35	5300.21	I	14	6490.70	I
1800	3883.44	II	35	4671.99	II	35	5302.69	I	14	6519.78	I
5400	3887.35	I	35	4675.10	I	55	5305.87	II	8	6575.54	I
440	3890.53	II	80	4675.31	I	650	5307.12	I	95	6604.96	I
440	3896.62	I	40	4677.86	II	16	5322.99	II	8	6627.25	I
680	3900.79	II	160	4681.92	I	35	5338.90	I	35	6657.72	I
3500	3916.48	I	70	4685.11	I		5339.03	I	11	6658.64	I
120	3928.66	II	120	4691.11	I	80	5346.49	II	11	6692.93	I
570	3929.58	II	110	4724.26	I	27	5372.98	II	30	6721.36	I
1500	3949.27	I	680	4733.34	I	14	5391.96	II	9	6726.34	I
1500	3958.10	II	35	4750.75	II	27	5400.46	II	9	6727.94	II
440	3995.58	II	70	4759.90	I	27	5402.23	I	18	6739.22	I
1800	3996.52	II	27	4789.92	II	14	5405.98	II	9 h	6767.48	I
220	4024.23	I	27	4807.48	I	14	5461.95	II	9	6777.93	I
380	4044.47	I	35	4808.68	I	14	5464.14	I	110	6779.77	I
10000	4094.19	I	35	4813.50	I	14	5465.54	II	14 h	6782.00	I
9500	4105.84	I	27	4826.99	II	16	5500.30	II	18	6788.52	I
120	4132.69	II	27	4828.97	I	14	5526.82	II	13 h	6820.27	I
1100	4138.33	I	80	4831.20	II	24	5528.34	I	14	6826.95	I
120	4149.14	I	35	4835.75	I	14	5539.03	II	14	6829.12	II
120	4158.60	I	27 d	4851.76	I	27	5566.00	I	23	6831.09	I
8800	4187.62	I		4851.90	II	22	5581.37	I	120	6844.26	I
520	4199.92	II	19	4872.28	II	14	5586.65	II	80	6845.76	I
6000	4203.73	I	27	4879.19	I	14	5589.94	II	18	6854.12	I
220	4206.00	II	27	4891.64	I	14	5606.64	I	6	6898.56	I
380	4222.67	I	24	4909.74	I	270	5631.41	I	6	6915.86	I
3000	4242.15	II	55	4923.83	I	40	5642.60	I	10	6937.37	I
270	4271.71	I	140	4957.18	I	27	5645.40	I	5	6949.54	I
150	4298.36	I	40	4970.87	II	70	5658.30	I	5 h	6976.69	II
2700	4359.93	I	27	4971.26	I	520	5675.84	I	5	7010.79	I
1400	4386.43	I	40	4975.12	II	14	5683.59	I	6 h	7014.31	II
200	4394.42	I	50	4978.90	I	40	5684.76	II	10	7017.90	I
120	4395.96	I	40	4980.68	II	14	5696.42	II	6 h	7029.40	I
140	4396.50	I	55	4989.32	II	35	5709.97	II	12	7034.34	I
55	4437.40	II	27	4993.79	II	22	5715.79	I	10	7056.43	II
80	4442.74	I	19	4994.72	II	14	5733.81	II	5	7060.97	I
50	4447.58	I	35	5001.02	I	11 d	5737.20	II	6	7079.78	II
120	4454.03	I	27	5001.59	I		5737.25	II	10	7106.14	I
80	4459.99	I	160	5009.77	II	14 h	5738.92	II	5 h	7231.33	I
50	4467.98	I	35	5014.56	II	27	5758.02	I	5	7233.74	II
540	4481.26	II	27	5017.87	II	55	5760.20	I	4	7257.72	I
80	4489.70	II	160	5034.22	II	190	5764.29	I	17	7272.62	I
150	4519.60	I	27 h	5041.00	II	5	5778.82	II	8	7284.30	I
260	4522.57	II	22	5043.50	I	19	5782.36	II	11 h	7286.16	I
180	4529.38	II	35	5045.41	I	22	5784.46	II	14	7310.51	I
80	4532.15	I	27	5060.42	II	11	5799.97	II	11	7336.63	II
110	4548.60	I	150	5060.90	I	14	5811.19	II	14	7432.18	I
40	4556.68	II	27	5062.25	I	14 h	5816.46	I	5	7434.51	II

Tm I and II

Intensity	Wavelength	
5	7439.95	II
75	7481.08	I
75	7490.20	I
10 n	7507.28	I
14	7545.78	I
140	7558.33	I
17 h	7580.61	I
20 h	7593.74	I
17	7595.07	II
5	7629.85	I
5 h	7648.76	II
17	7655.00	I
4	7660.32	I
7 h	7666.24	I
8	7676.04	II
8 h	7701.46	I
80	7731.53	I
4 h	7778.27	I
12 h	7782.35	I
8 h	7785.51	I
	7785.90	I
17	7803.93	I
4	7829.22	I
40	7856.08	I
3	7861.67	I
5	7918.10	I
55	7927.51	I
110	7930.84	I
6	7971.56	I
11 h	7985.93	I
14 h	8014.77	I
95	8017.90	I
3 h	8021.33	I
14	8194.19	I
5	8294.52	I
7	8365.75	I
7	8460.79	II
27	8472.01	II
7 h	8546.07	II
11	8565.73	II

Tm III
Ref. 307 - J.R.
Air

500	2099.11	III
500	2107.10	III
200	2136.67	III
200	2156.29	III
800	2182.98	III
300	2183.91	III
5000	2185.94	III
100	2212.25	III
300	2230.86	III
400	2231.25	III
200	2243.34	III
400	2243.98	III
200	2246.68	III
200	2269.39	III
1000	2276.91	III
100	2280.08	III
100	2281.27	III
100	2282.86	III
200	2282.98	III
200	2286.57	III
400	2287.21	III
500	2294.73	III
20000	2296.21	III
200	2297.43	III
100	2304.64	III

Tm III

Intensity	Wavelength	
400	2304.82	III
5000	2305.03	III
20000	2311.16	III
5000	2312.72	III
200	2314.88	III
400	2317.35	III
500	2320.96	III
200	2322.83	III
100	2323.71	III
100	2323.77	III
100	2324.43	III
500	2324.62	III
5000	2326.19	III
100	2327.02	III
300	2327.25	III
6000	2328.50	III
6000	2329.29	III
200	2330.87	III
3000	2331.80	III
400	2335.01	III
1000	2338.36	III
500	2341.74	III
300	2342.04	III
100	2344.59	III
500	2345.61	III
300	2347.43	III
400	2353.10	III
100	2355.65	III
3000	2357.05	III
1000	2361.23	III
500	2363.97	III
1000	2375.32	III
700	2375.83	III
400	2389.52	III
4000	2406.63	III
500	2435.31	III
500	2457.86	III
500	2471.23	III
30000	2489.44	III
200	2496.25	III
2000	2504.71	III
3000	2519.78	III
10000	2552.46	III
500	2557.90	III
1000	2574.52	III
500	2574.98	III
100	2581.84	III
100	2585.48	III
300	2589.20	III
500	2608.96	III
300	2609.66	III
500	2617.22	III
500	2618.78	III
1000	2621.12	III
400	2621.35	III
400	2622.31	III
100	2627.09	III
100	2628.83	III
300	2634.66	III
200	2636.68	III
200	2637.30	III
100	2640.32	III
500	2643.58	III
100	2645.05	III
200	2649.27	III
100	2650.82	III
100	2654.05	III
100	2656.30	III
500	2661.51	III

Tm III

Intensity	Wavelength	
1000	2663.00	III
500	2664.76	III
500	2664.88	III
200	2665.05	III
1000	2666.93	III
200	2668.59	III
100	2668.66	III
200	2669.18	III
100	2671.42	III
100	2675.30	III
1000	2676.64	III
500	2676.91	III
100	2678.28	III
100	2680.49	III
5000	2682.32	III
300	2682.64	III
300	2687.14	III
300	2695.69	III
400	2698.21	III
1000	2699.49	III
1000	2699.80	III
100	2703.63	III
200	2703.68	III
100	2704.93	III
2000	2707.03	III
300	2707.19	III
200	2707.44	III
500	2707.60	III
1000	2709.74	III
200	2710.79	III
1000	2713.38	III
200	2715.81	III
300	2717.56	III
100	2718.02	III
3000	2719.47	III
3000	2724.44	III
4000	2727.56	III
200	2728.13	III
1000	2731.38	III
300	2732.11	III
400	2737.98	III
800	2744.74	III
400	2745.99	III
500	2752.46	III
400	2753.20	III
400	2756.15	III
800	2765.98	III
700	2769.92	III
200	2772.64	III
100	2777.43	III
400	2781.12	III
2000	2806.77	III
300	2821.12	III
200	2849.52	III
700	2882.02	III
100	2899.29	III
100	2912.33	III
400	2921.08	III
200	2947.02	III
1000	2947.72	III
500	2953.18	III
100	2966.15	III
500	2966.85	III
400	2972.61	III
100	2974.85	III
1000	2998.28	III
100	3048.11	III
700	3078.87	III
200	3120.15	III

Tm III

Intensity	Wavelength	
200	3277.26	III
200	3407.73	III
100	3415.40	III
100	3415.96	III
100	3436.93	III
400	3467.93	III
200	3529.29	III
200	3533.28	III
100	3537.47	III
300	3562.41	III
100	3563.42	III
200	3587.74	III
600	3617.96	III
1000	3629.09	III
100	3706.11	III
100	3799.41	III
300	3998.84	III
200	4021.92	III
200	4026.03	III
700	4032.13	III
100	4076.15	III
200	4335.47	III
500	4385.41	III

TIN (Sn)

Z = 50

Sn I and II
Refs. 187,191 - C.H.C.
Vacuum

1	899.92	II
2	917.40	II
1	935.63	II
3	945.83	II
4	954.50	II
7	985.13	II
4	997.21	II
2	1016.26	II
4	1040.78	II
1	1041.32	II
3	1062.10	II
8	1108.19	II
4	1159.05	II
10	1161.43	II
3	1162.94	II
4	1180.51	II
9	1219.07	II
13	1223.70	II
11	1243.00	II
20	1290.86	II
20	1316.59	II
25	1400.52	II
20	1475.15	II
9	1489.22	II
7	16 9.47	II
10 r	1737.21	I
15 r	1751.46	I
10 h	1753.3	I
7	1758.00	II
20 r	1764.98	I
20	1773.40	I
30 r	1790.75	I
80 r	1804.60	I
15	1811.34	II
30	1813.04	I
40 r	1815.74	I
25	1819.31	I
120 r	1823.00	I

Sn I and II		
Intensity	Wavelength	
9	1831.89	II
50 r	1848.75	I
30	1852.00	I
200 r	1860.32	I
20	1861.42	I
20	1865.52	I
30	1865.96	I
15	1873.29	I
30	1882.64	I
80	1886.05	I
100	1891.40	I
20	1897.29	I
12	1899.91	II
50	1909.30	I
40	1911.61	I
20	1913.52	I
80	1925.31	I
20	1926.77	I
15	1927.95	I
40 h	1928.9	I
25	1933.17	I
20	1942.69	I
150	1952.15	I
15	1960.21	I
30	1971.46	I
50 h	1977.6	I
80	1984.20	I
15	1991.88	I
20	1994.98	I
	Air	
25	2008.05	I
30	2015.76	I
30	2026.98	I
50	2040.66	I
20	2040.90	I
50	2054.03	I
70	2058.31	I
20	2064.00	I
80	2068.58	I
100	2072.89	I
100	2073.08	I
25	2080.62	I
30	2091.58	I
40	2094.35	I
200	2096.39	I
100	2100.93	I
100 r	2113.93	I
50	2121.26	I
25	2140.73	I
20	2141.43	I
15	2148.46	I
1	2148.63	II
40 r	2148.73	I
20 r	2151.43	I
30	2151.54	II
80	2171.32	I
150 r	2194.49	I
300 r	2199.34	I
400 r	2209.65	I
4	2209.67	II
40	2211.05	I
80 r	2231.72	I
400 r	2246.05	I
6	2246.07	II
60	2251.17	I
30	2267.19	I
400 r	2268.91	I
20	2282.26	I
200 r	2286.68	I

Sn I and II		
Intensity	Wavelength	
600 r	2317.23	I
300 r	2334.80	I
1000 r	2354.84	I
20	2357.90	I
3	2360.34	II
22	2368.33	II
60	2380.72	I
4	2384.54	II
100	2408.15	I
800 r	2421.70	I
1000 r	2429.49	I
1	2433.52	II
15	2448.98	II
60	2455.24	I
20	2476.40	I
300	2483.39	I
13	2483.48	II
10	2486.99	II
200	2495.70	I
5	2522.61	II
90	2523.92	I
80 h	2531.17	I
400	2546.55	I
40 h	2558.01	I
500 r	2571.58	I
200	2594.42	I
50 h	2636.94	I
200 r	2661.24	I
2	2664.93	II
700 r	2706.51	I
2	2727.82	II
20	2761.78	I
150	2779.81	I
80	2785.03	I
60	2787.96	I
60	2812.59	I
80	2813.58	I
2	2825.52	II
1400 r	2839.99	I
1	2846.42	II
200	2850.62	I
1000 r	2863.32	I
1	2912.80	II
200	2913.54	I
6	2919.82	II
3	2991.00	II
7	2994.44	II
700 r	3009.14	I
1	3012.18	II
8	3023.94	II
200	3032.80	I
850 r	3034.12	I
12	3047.50	II
6	3094.69	II
60	3141.84	I
550 r	3175.05	I
40	3218.71	I
550 r	3262.34	I
50	3283.21	II
110	3330.62	I
60	3351.97	II
2	3407.48	II
10	3472.46	II
7	3537.57	II
11	3575.45	II
3	3582.39	II
2	3620.08	II
6	3620.54	II
40	3655.78	I

Sn I and II		
Intensity	Wavelength	
6	3715.23	II
280 r	3801.02	I
4	3841.44	II
1	4294.65	II
40	4524.74	I
1	4579.13	II
1	4580.29	II
2	4877.22	II
3	4944.31	II
20	4979.73	I
2	5071.14	II
2	5072.67	II
20	5174.54	I
10	5332.36	II
20	5561.95	II
25	5588.92	II
2	5596.20	II
500	5631.71	I
15	5753.59	I
1	5797.20	II
15	5799.18	II
50	5925.44	I
100	5970.30	I
150	6037.70	I
200	6054.86	=
250	6069.00	I
100	6073.46	I
6	6077.48	II
5	6079.70	II
400	6149.71	I
200	6154.60	I
150	6171.50	I
100	6310.78	I
40	6354.35	I
70	6453.50	II
8	6761.45	II
25	6844.05	II
20	7191.40	II
10	7387.79	II
20 h	7398.6	I
1	7408.62	II
30	7685.30	I
13	7741.80	II
100	7754.97	I
3	7904.00	II
100 h	8030.5	I
30 h	8039.3	I
200	8114.09	I
30 h	8121.0	I
30	8349.35	I
80	8357.04	I
300	8422.72	I
400	8552.60	I
50 h	8681.7	I
30 h	9018.95	I
50 h	9410.86	I
80 h	9415.37	I
150	9616.40	I
50	9741.1	I
100 h	9742.8	I
300 h	9805.38	I
500	9850.52	I
25	10456.47	I
11	10807.58	I
54	10894.00	I
70	11191.85	I
56	11277.66	I
17	11336.97	I
200	11454.59	I

Sn I and II		
Intensity	Wavelength	
200	11616.26	I
76	11670.77	I
25	11694.45	I
258	11739.78	I
96	11825.18	I
106	11835.82	I
254	11932.99	I
48	12009.50	I
111	12313.24	I
33	12335.6	I
42	12530.87	I
42	12536.5	I
37	12788.2	I
89	12888.5	I
187	12981.7	I
20	13000.3	I
187	13018.5	I
68	13081.5	I
378	13460.2	I
144	13608.2	I
13	15018.2	I
30	15464.2	I
20	17000.5	I
10	17807.5	I
20	20622.2	I
40	20861.7	I
8	21686.2	I
4	22131.7	I
3	22997.2	I
4	24327.2	I
4	24738.2	I

Sn III		
Ref. 423 – C.H.C.		
Vacuum		
100	753.01	III
50	760.62	III
75	775.79	III
50	784.68	III
200	910.92	III
50	1010.92	III
50	1048.84	III
1000	1139.29	III
1000	1158.33	III
200	1161.09	III
100	1161.58	III
100	1180.62	III
1000	1184.25	III
200	1189.99	III
200	1204.06	III
2000	1210.52	III
100	1215.10	III
100	1218.14	III
100	1230.17	III
100	1231.38	III
500	1243.63	III
1000	1259.92	III
40	1276.31	III
1000	1305.97	III
1000	1327.34	III
200	1334.70	III
200	1346.05	III
1000	1347.65	III
200	1369.71	III
1000	1386.74	III
500	1410.61	III
200	1449.77	III
1000	1570.36	III
50	1674.29	III

Sn III

Intensity	Wavelength	
500	1811.71	III
500	1941.86	III
50	1955.52	III

Sn IV

Ref. 423 - C.H.C.

Vacuum

50	605.23	IV
50	619.04	IV
50	628.73	IV
50	908.22	IV
500	956.25	IV
500	1019.72	IV
1000	1044.49	IV
100	1058.37	IV
50	1058.59	IV
1000	1073.41	IV
200	1087.50	IV
300	1096.92	IV
50	1103.24	IV
000	1119.34	IV
200	1120.68	IV
1000	1314.55	IV
1000	1437.52	IV
100	1532.90	IV

Sn V

Refs. 399,423 - C.H.C.

Vacuum

120	355.14	V
150	361.01	V
100	372.55	V
200	1089.35	V
100	1132.79	V
200	1160.74	V
100	1176.26	V
100	1189.92	V
100	1205.72	V
2000	1251.38	V
100	1283.81	V
200	1294.36	V
100	1302.20	V

TITANIUM (Ti)

Z = 22

Ti I and II

Ref. 1 - C.H.C.

Air

140	2272.61	I
180	2273.28	I
130	2276.70	I
190	2279.96	I
150	2299.85	I
140	2302.73	I
190	2305.67	I
65	2380.81	I
35	2384.52	I
55	2418.36	I
75	2421.30	I
95	2424.24	I
40	2428.23	I
35	2433.22	I
19	2434.10	I
35	2440.21	II
65	2440.98	I
24	2450.44	II
24	2504.54	I
75	2517.43	II

Ti I and II

Intensity	Wavelength	
40	2519.04	I
140	2520.54	I
75	2524.64	II
360	2525.60	II
29	2527.98	I
210	2529.85	I
190	2531.25	II
190	2534.62	II
130	2535.87	II
190	2541.92	I
65	2555.99	II
110	2571.03	II
50	2572.65	II
50	2580.82	I
35	2590.26	I
190	2593.64	I
65	2596.58	I
270	2599.92	I
340	2605.15	I
510	2611.28	I
75	2611.48	I
300	2619.94	I
170	2631.54	I
170	2632.42	I
640	2641.10	I
800	2644.26	I
950	2646.64	I
30	2649.30	I
15	2654.93	I
35	2657.19	I
85	2661.97	I
95	2669.60	I
130	2679.93	I
26	2684.80	I
30	2685.14	I
65	2688.82	I
26	2716.25	II
85	2725.07	I
75	2727.42	I
21	2731.13	I
40	2731.58	I
170	2733.26	I
55	2735.29	I
40	2735.61	I
85	2739.81	I
250	2742.32	I
40	2749.06	I
65	2757.40	I
95	2758.08	I
15	2761.29	II
250	2802.50	I
55	2805.70	I
30	2806.50	II
40	2809.17	I
75	2810.30	II
30	2812.98	I
30	2817.40	I
65	2817.84	I
	2817.87	II
65	2828.07	I
	2828.15	II
130	2832.16	II
190	2841.94	II
110	2851.10	II
40	2853.93	II
95	2862.32	II
55	2868.74	II
180	2877.44	II
280	2884.11	II

Ti I and II

Intensity	Wavelength	
65	2888.93	II
55	2891.07	II
55	2905.66	I
30	2909.92	II
450	2912.08	I
340	2928.34	I
15	2931.03	
180	2933.55	I
26	2935.96	
150	2937.32	I
1100	2942.00	I
1300	2948.26	I
30	2954.58	
1600	2956.13	I
170	2956.80	I
30	2958.77	
26	2959.71	I
35	2959.99	I
170	2965.71	I
190	2967.22	I
26	2968.23	I
75	2970.38	I
30	2974.93	I
170	2983.31	I
35	3000.87	I
120	3017.19	II
140	3029.73	II
110	3046.68	II
130	3056.74	II
130	3057.40	II
170	3058.09	II
85	3059.74	II
1300 d	3066.22	II
	3066.35	II
70	3071.24	II
600	3072.11	II
1100	3072.97	II
1600	3075.22	II
2300	3078.64	II
3600	3088.02	II
180	3089.40	II
180	3097.19	II
180	3100.67	I
230	3103.80	II
230	3105.08	II
260	3106.23	II
70	3106.81	I
50	3110.67	II
50	3112.48	I
140	3117.67	II
720	3119.72	I
	3119.80	II
190	3123.07	I
240	3130.80	II
140	3141.54	I
95	3141.67	I
220	3143.76	II
240	3148.04	II
240	3152.25	II
240	3154.20	II
240	3155.67	II
500	3161.20	II
780	3161.77	II
1000	3162.57	II
1600	3168.52	II
2400	3186.45	I
1000	3190.87	II
3100	3191.99	I
50	3197.52	II

Ti I and II

Intensity	Wavelength	
3800	3199.92	I
780	3202.54	II
50	3203.44	II
240	3203.83	I
50	3204.87	I
110	3213.14	II
260	3214.24	I
190	3214.75	II
1100	3217.06	II
110	3217.94	I
260	3218.27	II
110	3219.21	I
110	3221.38	I
1300	3222.84	II
220	3223.52	I
240	3224.24	II
140	3226.13	I
530	3228.60	II
780	3229.19	II
530	3229.42	II
110	3231.32	II
240	3232.28	II
6600	3234.52	II
220	3236.12	II
5200	3236.57	II
4100	3239.04	II
220	3239.66	II
2600	3241.99	II
1200	3248.60	II
950	3251.91	II
1200	3252.91	II
1200	3254.25	II
1200	3261.60	II
310	3271.65	II
310	3272.08	II
200	3278.29	II
260	3278.92	II
220	3282.33	II
530	3287.66	II
290	3292.08	I
170	3299.41	I
170	3306.88	I
220	3308.39	I
220	3308.81	II
260	3309.50	I
60	3309.73	I
110	3312.69	I
840	3314.42	I
	3314.52	I
290	3315.32	II
330	3318.02	II
550	3321.70	II
2900	3322.94	II
380	3326.76	II
2100	3329.46	II
550	3332.11	II
1800	3335.20	II
1100	3340.34	II
5700	3341.88	I
120	3342.15	I
260	3343.77	II
330	3346.73	II
4300	3349.04	II
12000	3349.41	II
120	3352.94	I
4100	3354.64	I
290	3358.28	I
290	3360.99	I
7200	3361.21	II

Ti I and II			Ti I and II			Ti I and II			Ti I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
	3361.26	I	140	3694.45	I	4500	3948.67	I	40	4224.79	I
120	3361.84	I	30	3698.18	I	4500	3956.34	I	40	4227.65	I
1100	3370.44	I	60	3698.43	I	5200	3958.21	I	130	4237.89	I
4300	3371.45	I	60	3700.08	I	950	3962.85	I	85	4249.12	I
140	3372.21	II	120	3702.29	I	950	3964.27	I	130	4256.04	I
5700	3372.80	II	190	3704.30	I	4800	3981.76	I	70	4258.54	I
60	3374.35	II	140	3706.23	II	570	3982.48	I	70	4261.60	I
2900 d	3377.48	I	50	3707.53	I	60	3984.33	I	330	4263.13	I
	3377.58	I	290	3709.96	I	35	3985.25	I	35	4265.71	I
290	3379.22	I	30	3715.40	I	60	3985.59	I	40	4266.22	I
1400	3380.28	II	450	3717.40	I	5700	3989.76	I	70	4270.14	I
170	3382.31	I	140	3721.64	II	35	3994.70	I	85	4272.43	I
5700	3383.76	II	330	3722.57	I	7800	3998.64	I	240	4274.58	I
170	3385.66	I	600	3724.57	I	70	3999.36	I	120	4276.43	I
1400	3385.95	I	380	3725.16	I	70	4002.49	I	120	4278.23	I
1400	3387.84	II	2900	3729.82	I	70	4003.81	I	30	4278.81	I
60	3388.76	II	50	3735.67	I	35	4005.97	I	110	4281.38	I
140	3390.68	I	60	3738.90	I	70	4008.06	I	220	4282.71	I
140	3392.71	I	3300	3741.06	I	950	4008.93	I	160	4284.99	I
1100	3394.58	II	330	3741.64	II	190	4009.66	I	890	4286.01	I
60	3398.63	I	160	3748.10	I	70	4012.39	II	840	4287.40	I
60	3402.42	II	5200	3752.86	I	180	4013.58	I	30	4288.16	I
60	3407.20	II	600	3753.64	I	70	4015.38	I	950	4289.07	I
95	3409.81	II	140	3757.69	II	35	4016.28	I	120	4290.23	II
60	3439.30	I	3300	3759.30	II	120 h	4017.77	I	840	4290.94	I
890	3444.31	II	2900	3761.32	II	140	4021.83	I	120	4291.14	I
60	3452.47	II	50	3761.89	II	1200	4024.57	I	140	4294.12	II
180	3456.39	II	60	3766.45	I	40	4025.14	II	840	4295.76	I
600	3461.50	II	600	3771.66	I	190 h	4026.54	I	2000	4298.66	I
95	3467.26	I	30	3776.06	II	40	4027.48	I	200	4299.23	I
600	3477.18	II	840	3786.04	I	40	4028.34	II	200	4299.64	I
60	3478.92	I	120	3789.30	I	190 h	4030.51	I	200	4300.05	II
240	3480.53	I	70	3795.90	I	40	4033.91	I	2900	4300.56	I
60	3485.69	I	60	3798.31	I	30	4034.91	I	4100	4301.09	I
60	3489.74	II	70	3818.22	I	110	4035.83	I	85	4301.93	II
480	3491.05	II	60	3822.03	I	35 h	4040.32	I	6000	4305.92	I
60	3495.75	I	240	3828.19	I	290	4055.02	I	180	4307.90	II
95	3499.10	I	95	3833.68	I	85	4057.62	I	35	4308.50	I
890	3504.89	II	95	3836.78	I	85	4058.14	I	40	4311.65	I
120	3506.64	I	60	3846.45	I	410	4060.26	I	85	4312.87	II
600	3510.84	II	130	3853.05	I	200	4064.22	I	85	4314.35	I
60	3520.25	II	130	3853.73	I	200	4065.10	I	1200	4314.80	I
310	3535.41	II	170	3858.14	I	840	4078.47	I	360	4318.64	I
190	3547.03	I	240	3866.44	I	40	4079.72	I	180	4321.66	I
120	3573.74	II	170	3868.40	I	290	4082.46	I	190	4325.13	I
60	3574.24	I	120	3873.21	I	85	4099.17	I	160	4326.36	I
60	3587.13	II	260	3875.26	I	220	4112.71	I	30	4334.84	I
240	3596.05	II	170	3882.15	I	85	4122.17	I	160	4337.92	II
190	3598.72	I	170	3882.33	I	40	4123.31	I	24	4344.29	II
600	3610.16	I	500	3882.89	I	85	4123.57	I	70	4346.11	I
190	3624.82	II	60 h	3888.02	I	130	4127.54	I	35	4354.06	I
95	3635.20	I	70	3889.95	I	40	4129.17	I	95	4360.49	I
4800	3635.46	I	200 h	3895.25	I	40	4131.25	I	24	4368.94	I
120	3637.97	I	85	3898.49	I	140	4137.29	I	95	4369.68	I
190	3641.33	II	530	3900.54	II	85	4143.05	I	60	4372.38	I
6600	3642.68	I	180	3900.96	I	170	4150.96	I	30	4388.08	I
180	3646.20	I	2600	3904.78	I	85	4159.64	I	170	4393.92	I
7200	3653.50	I	110 h	3911.19	I	70	4163.65	II	330	4395.04	II
290	3654.59	I	500	3913.46	II	35	4164.14	I	60	4399.77	II
660	3658.10	I	500	3914.34	I	40	4166.32	I	240	4404.28	I
120	3659.76	II	24	3914.74	I	85	4169.35	I	60	4404.90	I
380	3660.63	I	35	3919.82	I	120	4171.03	I	30	4405.68	I
190	3662.24	II	290	3921.42	I	40	4171.90	II	60	4416.54	I
380	3668.97	I	1100	3924.53	I	35	4183.30	I	220	4417.28	I
600	3671.67	I	110	3926.32	I	360	4186.12	I	60	4417.72	II
3100	3685.20	II	890	3929.88	I	40	4188.69	I	120	4421.76	I
120	3685.96	I	35	3932.02	II	70	4200.75	I	120	4422.82	I
95	3687.35	I	70	3934.24	I	85	4203.46	I	24	4424.39	I
600	3689.91	I	1100	3947.78	I	35	4211.73	I	30	4425.83	I

Ti I and II			Ti I and II			Ti I and II			Ti I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
120	4426.06	I	240	4571.98	II	55	4925.41	I	75	5207.87	I
890	4427.10	I	19	4585.84		30	4926.16	I	65	5208.42	
21	4430.02	I	24	4589.95	II	150	4928.34	I	1400	5210.39	I
85	4430.37	I	60	4599.23	I	30	4937.74	I	65	5212.29	I
50	4431.28	I	21	4609.37	I	95	4938.29	I	150	5219.71	I
30	4432.60	I	950	4617.27	I	30	4941.58	I	95	5222.69	I
24	4433.58	I	24	4619.52	I	21	4948.19	I	85	5223.64	I
170	4434.00	I	480	4623.09	I	21	4958.25	I	250	5224.32	I
70	4436.59	I	190	4629.34	I	55	4964.75	I	95	5224.56	I
30	4438.23	I	50 d	4634.87		21	4966.04	I	190	5224.95	I
130	4440.35	I	60	4637.88	I	65	4968.58	I	65	5226.56	II
50	4441.27	I	240	4639.37	I	75	4973.05	I	120	5238.58	I
230	4443.80	II	220	4639.67	I	120	4975.35	I	21	5246.15	I
24	4444.27	I	190	4639.95	I	65	4977.74	I	55	5246.57	I
840	4449.15	I	140	4645.19	I	120	4978.20	I	75	5247.31	I
30	4450.49	II	120	4650.02	I	5800	4981.73	I	21	5250.95	I
550	4450.90	I	24	4656.04	I	150	4989.15	I	110	5252.11	I
840	4453.32	I	720	4656.47	I	4600	4991.07	I	75	5255.83	I
290	4453.71	I	840	4667.59	I	30	4995.08	I	55	5259.99	I
950	4455.33	I	70	4675.12	I	140	4997.10	I	55	5263.50	I
1100	4457.43	I	950	4681.92	I	4000	4999.51	I	150	5265.98	I
21	4462.09	I	21	4686.92	I	230	5001.01	I	40	5282.39	I
70	4463.38	I	24	4690.80	I	3600	5007.21	I	140	5283.45	I
95	4463.54	I	190	4691.34	I	120	5009.65	I	35	5284.39	I
290	4465.81	I	40	4693.68	I	230	5013.30	I	26	5288.81	
240	4468.50	II	24	4696.94	I	3200 d	5014.19	I	65	5295.79	I
240	4471.24	I	190	4698.76	I		5014.24	I	120	5297.26	I
95	4474.85	I	120	4710.19	I	580	5016.17	I	65	5298.44	I
95	4479.70	I	24	4715.30	I	840	5020.03	I	26	5336.81	II
50	4480.59	I	65	4722.62	I	840	5022.87	I	17	5341.50	I
530	4481.26	I	65	4723.17	I	580	5024.84	I	75	5351.08	I
95	4482.69	I	55	4731.17	I	300	5025.58	I	26	5366.65	I
19	4488.32	II	45	4733.43	I	1200	5035.91	I	55	5369.64	I
260	4489.09	I	18	4734.68	I	840	5036.47	I	40	5389.18	I
24	4492.55	I	22	4742.11	I	740	5038.40	I	55	5389.99	I
40	4495.01	I	170	4742.79	I	1200	5039.95	I	17	5396.60	I
240	4496.15	I	22	4747.68	I	75	5040.62	I	85	5397.09	I
24	4497.73	I	310	4758.12	I	85	5043.59	I	35	5404.02	I
200	4501.27	II	310	4759.28	I	35	5044.27	I	110	5409.61	I
40	4503.78	I	45	4766.33	I	55	5045.41	I	40	5426.26	I
21	4506.36	I	28	4769.77	I	26	5048.21	I	75	5429.15	I
50	4511.17	I	65	4778.26	I	110	5052.87	I	26	5436.73	I
780	4512.74	I	45	4781.72	I	21	5054.08	I	17	5438.32	I
19	4515.62	I	110	4792.49	I	110	5062.11	I	40	5446.64	I
1000	4518.03	I	45	4796.22	I	35	5064.07	I	11bl	5448.34	TiO
95	4518.70	I	35	4797.98	I	1400	5064.66	I	30	5448.90	I
1000	4522.80	I	110	4799.80	I	95	5065.99	I	21	5449.16	I
780	4527.31	I	28	4805.10	II	35 h	5068.33	I	35	5453.65	I
6000	4533.24	I	110	4805.43	I	65	5069.35	I	55	5460.51	I
240	4533.97	II	45	4808.53	I	130	5071.48	I	75	5471.21	I
3600	4534.78	I	22	4811.08	I	40	5085.34	I	35	5472.70	I
2400	4535.58	I	40	4812.25	I	130	5087.07	I	40 h	5473.55	I
1200	4535.92	I	200	4820.42	I	21	5103.15	I	85	5474.23	I
1200	4536.05	I	22	4825.46	I	55	5109.44	I	30	5474.46	I
24	4537.23	I	40	4836.13	I	190	5113.44	I	120 h	5477.71	I
24	4539.10	I	470	4840.87	I	270	5120.42	I	110	5481.43	I
720	4544.69	I	65	4848.47	I	30	5129.15	II	75	5481.87	I
950	4548.77	I	290	4856.01	I	270	5145.47	I	85 h	5488.20	I
240	4549.63	II	35	4864.18	I	230	5147.48	I	150	5490.15	I
950	4552.46	I	200	4868.26	I	210	5152.20	I	26	5490.84	I
24	4555.08	I	250	4870.14	I	21bl	5166.86	TiO	110	5503.90	I
720	4555.49	I	28	4880.91	I	1100	5173.75	I	40	5511.78	I
19	4557.86	I	45	4882.35	I	40	5186.34	I	340	5512.53	I
19	4558.11	I	400	4885.08	I	85	5188.70	II	270	5514.35	I
60	4559.92	I	380	4899.91	I	30	5189.58	I	320	5514.54	I
50	4562.63	I	320	4913.62	I	1300	5192.98	I	26	5530.49	
35	4563.43	I	55	4915.24	I	85 h	5194.04	I	110	5565.49	I
110	4563.77	II	130	4919.87	I	65	5201.10	I	13	5579.16	
35	4570.91	I	180	4921.77	I	120	5206.08	I	21 h	5582.98	

Ti I and II		
Intensity	Wavelength	
30 h	5585.68	
65bl	5597.85	TiO
55bl	5629.28	TiO
17	5635.84	
250	5644.14	I
75	5648.58	I
26bl	5661.55	TiO
190	5662.16	I
75	5662.91	I
21	5673.42	I
130	5675.44	I
30 h	5679.94	I
95	5689.47	I
75	5702.68	I
35	5708.23	I
65	5711.88	I
40 h	5713.92	I
95	5715.13	I
55	5716.48	I
35	5720.48	I
85	5739.51	I
40	5740.02	I
19	5741.22	I
21	5752.84	I
19	5756.86	I
40 h	5762.27	I
55 h	5766.35	I
75 h	5774.05	I
30	5780.78	I
75 h	5785.98	I
65hl	5804.26	I
21bl	5814.96	TiO
40	5823.71	I
21 h	5841.18	
21	5852.34	
400	5866.46	I
65	5880.31	I
21 h	5888.68	
230	5899.32	I
55	5903.33	I
120	5918.55	I
150	5922.12	I
75	5937.82	I
120	5941.76	I
300	5953.17	I
200	5965.84	I
270	5978.56	I
340	5999.04	I
65	5999.68	I
21	6012.73	
110	6064.63	I
120	6085.23	I
120	6091.17	I
40	6092.81	I
40 h	6098.67	I
35 h	6121.01	I
120	6126.22	I
19	6138.38	I
30	6146.22	I
21	6149.74	I
30bl	6162.23	TiO
35	6186.15	I
95 h	6215.28	I
75 h	6220.49	I
65 h	6221.41	I
380	6258.10	I
380	6258.70	I
300	6261.10	I
65	6303.75	I

Ti I and II		
Intensity	Wavelength	
55	6312.24	I
26	6318.03	I
30	6336.10	I
35	6366.35	I
11	6419.10	I
17	6497.69	I
19	6508.14	I
55	6546.28	I
65	6554.23	I
11 h	6554.83	
75	6556.07	I
19 h	6565.62	I
14 h	6575.18	I
35	6599.11	I
18bl	6651.46	TiO
18 h	6666.55	I
22 h	6667.74	
9	6668.39	
18	6677.18	I
22 b	6691.21	TiO
26	6716.68	I
16bl	6723.95	TiO
80	6743.12	I
22	6745.52	I
18	6844.64	
18	6860.39	
35	6861.47	I
9	6873.92	I
12	6913.19	I
14 h	6933.15	I
14 h	6943.70	I
23	6996.63	I
15	7004.66	I
14	7008.35	I
14	7010.94	I
14 h	7035.86	I
40	7038.80	I
14	7050.65	I
40bl	7054.51	TiO
23	7069.11	I
23	7072.05	
45bl	7087.89	TiO
30 b	7124.9	TiO
40bl	7125.61	TiO
26	7138.91	I
26	7167.13	
23	7171.53	
55	7189.89	I
26 b	7203.64	TiO
260	7209.44	I
60	7216.20	I
130	7244.86	I
130	7251.72	I
19	7263.40	
19	7266.29	I
19 b	7269.05	TiO
15	7315.56	I
26	7318.39	I
120	7344.72	I
11	7352.16	I
90	7357.74	I
60	7364.11	I
26	7440.60	I
9	7474.94	I
26	7489.61	I
19	7496.12	I
12	7580.55	I
9bl	7589.62	TiO
15	7614.50	I

Ti I and II		
Intensity	Wavelength	
23	7654.44	I
11bl	7705.21	TiO
30	7949.17	I
26 h	7961.58	I
60	7978.88	I
9	7979.07	I
30	7996.53	I
7 h	8003.55	
55	8024.84	I
30	8068.24	I
8	8267.62	
14 h	8306.31	I
9 h	8307.41	I
9 h	8311.76	I
8 h	8312.85	I
12	8334.37	I
14	8353.15	I
75	8364.24	I
100	8377.85	I
100	8382.54	I
55	8382.82	I
75	8396.87	I
120	8412.36	I
19	8416.98	I
15	8424.41	I
170	8426.52	I
490	8434.94	I
240	8435.70	I
40	8438.93	I
40	8450.89	I
9 h	8457.10	I
19 h	8467.15	I
45	8468.50	I
15	8496.04	I
19 h	8518.05	I
40	8518.32	I
14	8539.38	I
40	8548.12	I
9	8569.77	I
9 h	8598.18	I
90	8675.39	I
45	8682.99	I
23	8692.33	I
19	8734.69	I
23	8766.64	I
15 h	8778.71	I

Ti III		
Ref. 378 - C.H.C.		
Vacuum		
6	1282.48	III
6	1286.23	III
15	1286.36	III
10	1289.30	III
10	1291.62	III
10	1293.23	III
15	1294.70	III
10	1295.88	III
20	1298.66	III
20	1298.97	III
12	1327.59	III
10	1420.04	III
10	1420.44	III
10	1421.63	III
10	1421.77	III
12	1422.40	III
10	1424.14	III
23	1455.19	III
10	1498.70	III

Ti III		
Intensity	Wavelength	
	Air	
10	2199.22	III
12	2237.77	III
10	2327.02	III
15	2331.35	III
15	2331.66	III
15	2334.34	III
17	2339.00	III
18	2346.79	III
18	2374.99	III
22	2413.99	III
25	2516.05	III
24	2527.84	III
23	2540.06	III
24	2563.44	III
23	2565.42	III
22	2567.56	III
15	2576.47	III
15	2580.46	III
10	2692.16	III
12	2701.96	III
22	2984.75	III
12 d	3354.71	III
12	3872.50	III
12	3881.21	III
12	3893.63	III
10	3896.33	III
15	3915.47	III
12	3921.38	III
10	3921.61	III
12	3922.95	III
10	3924.86	III
10	4060.21	III
10	4119.14	III
11	4215.52	III
11	4269.84	III
11	4296.70	III
10	4348.04	III
11	4433.91	III
10	4540.22	III
15	4549.84	III
10 d	4555.46	III
15 d	4572.20	III
10	4649.45	III
12	4652.86	III
10	4874.00	III
10	4950.10	III
10	4971.19	III
10	5083.80	III
14	5147.31	III
12 d	5226.28	III
11	5247.49	III
17	5278.12	III
10	5278.70	III
12	5298.43	III
16	5301.20	III
15	5306.88	III
10	5395.69	III
12	5533.01	III
10	5817.44	III
12	6611.38	III
18	6621.58	III
10	6629.37	III
14	6647.47	III
18	6667.99	III
15	6674.19	III
14	6707.76	III
12	6724.80	III
16	6734.10	III

Ti III		
Intensity	Wavelength	
15	6862.26	III
12	6874.35	III
10	6896.12	III
12	7015.38	III
10	7071.93	III
20	7072.64	III
18	7084.57	III
15	7124.13	III
11	7171.79	III
10	7175.92	III
10	7217.50	III
9	7225.55	III
12	7270.67	III
14	7316.30	III
10	7316.68	III
12	7379.96	III
10	7408.13	III
10	7457.85	III
15	7506.87	III
17	7507.68	III
10	7523.85	III
12	7544.29	III
9	7566.25	III
10 h	8172.21	III
9 h	8173.37	III
9 h	8178.00	III
10	8182.42	III
9 h	8192.68	III
9 h	8194.75	III
9 h	8263.67	III
15 h	8267.32	III
10	8338.54	III
12	8394.20	III
20	8466.87	III
5	8699.85	III
3	9017.10	III

Ti IV		
Ref. 428 - C.H.C.		
Vacuum		
10	776.76	IV
18	779.07	IV
16	781.73	IV
8	1183.64	IV
10	1195.21	IV
18	1451.74	IV
20	1467.34	IV
12	1469.19	IV
Air		
20	2067.56	IV
18	2103.16	IV
10	2359.14	IV
10	2359.50	IV
8	2541.79	IV
10	2546.88	IV
5	2862.60	IV
6	2929.96	IV
14	2937.33	IV
12	2957.31	IV
15	3541.36	IV
17	3576.44	IV
10	3581.39	IV
13	4131.22	IV
14	4133.78	IV
10	4397.33	IV
9	4403.45	IV
15	4618.11	IV
20	5398.93	IV
8	5470.98	IV

Ti IV		
Intensity	Wavelength	
18	5492.51	IV
10	5517.72	IV
14	5877.79	IV
15	5885.96	IV
7	5891.15	IV
6	6231.62	IV
17	6246.65	IV
11	6247.74	IV
15	6292.41	IV
12	6913.85	IV
15	6978.51	IV
9	7491.37	IV
8	7494.77	IV
5 h	7652.12	IV
8 h	7706.85	IV

Ti V		
Ref. 427 - C.H.C.		
Vacuum		
12	225.35	V
10	228.91	V
17	252.96	V
7	323.36	V
7	461.41	V
8	474.69	V
8	483.99	V
10 d	488.58	V
15	498.26	V
14	502.08	V
7	502.71	V
12	504.66	V
7	506.47	V
8	513.37	V
7	523.05	V
12	524.58	V
13	526.57	V
8	529.32	V
10	535.84	V
10	535.89	V
8 d	540.14	V
8	541.46	V
9	541.71	V
7	543.10	V
7	543.34	V
7	1128.55	V
8	1192.35	V
9	1198.66	V
9	1222.36	V
10	1230.36	V
11	1239.96	V
10	1241.67	V
7	1246.13	V
8	1268.49	V
8	1306.11	V
8	1411.31	V
9	1675.15	V
8	1687.16	V
11	1717.40	V
8	1759.76	V
7	1771.45	V
10	1841.49	V
7	1864.45	V
7	1881.89	V
7	1920.16	V
7	1988.75	V

TUNGSTEN (W)

Z = 74

W I and II		
Ref. 1 - C.H.C.		
Intensity	Wavelength	
Air		
5800	2001.71	II
13000	2008.07	II
5100	2009.98	II
4100	2010.23	II
4100	2014.23	II
7300	2026.08	II
15000	2029.98	II
2700	2035.03	II
5300	2049.63	II
2300	2065.57	II
3400	2071.21	II
2200	2075.59	II
9700	2079.11	II
3600	2088.19	II
2200	2089.14	II
1700	2090.48	I
6100	2094.75	II
2400	2098.60	II
2200	2100.67	II
1500	2101.54	I
1500	2106.18	II
1300	2110.34	II
2100	2118.87	II
2400	2121.59	II
850	2153.56	II
850	2157.80	II
1500	2166.32	II
480	2182.90	I
440	2194.52	II
1300	2204.48	II
460	2248.75	II
460	2249.80	I
180	2270.24	II
95	2271.37	I
510	2277.58	I
160	2284.91	I
320	2285.17	I
530 d	2294.49	I
	2294.54	II
270	2298.33	I
240	2303.83	II
240	2306.59	I
340	2309.02	I
440	2313.17	I
220	2314.17	I
190	2315.02	II
460	2321.63	I
290	2326.09	II
390 d	2326.56	I
	2326.70	I
75	2328.31	II
130	2333.77	II
210	2341.37	I
75	2349.26	II
120 d	2350.37	II
320	2354.61	I
60	2358.81	II
580	2360.44	I
850	2363.07	I
60	2364.22	II
510	2374.47	I
210	2382.99	I
670	2384.82	I
240	2389.08	I
120	2390.37	II

W I and II		
Intensity	Wavelength	
120	2392.93	II
730	2397.09	II
560	2397.73	I
560	2397.98	I
75	2404.24	II
1700 d	2405.58	I
	2405.69	I
75	2411.54	II
320	2414.04	I
610	2415.68	I
50	2419.34	II
50	2421.01	II
870	2424.21	I
190	2427.49	II
170	2429.39	II
580	2431.08	I
630	2433.98	I
60	2435.01	II
1800	2435.96	I
250	2436.62	I
580	2444.06	I
160	2446.39	II
270	2448.39	I
270	2451.35	I
780	2451.48	II
870	2452.00	I
430	2454.72	I
630	2454.98	I
780	2455.51	I
780	2456.53	I
1100	2459.30	I
270	2460.16	I
480	2462.79	I
270	2464.30	I
230	2466.52	II
1400	2466.85	I
75	2470.80	II
480	2472.51	I
1200	2474.15	I
290	2477.80	II
870	2480.13	I
390	2480.96	I
1500	2481.44	I
480 d	2482.10	I
	2482.21	I
29	2484.40	II
580	2484.74	I
390	2487.50	I
270	2488.77	II
390	2489.23	II
75	2492.93	II
630	2495.26	I
230	2496.64	II
95	2497.48	II
140	2499.69	II
40	2500.11	II
	2501.90	II
680	2504.70	I
270	2506.02	I
24	2508.00	II
250	2510.17	I
75	2510.47	II
60	2518.14	II
310	2520.46	I
780	2521.32	I
270	2522.04	II
780	2523.41	I
430	2527.76	I
780	2533.64	I

W I and II			W I and II			W I and II			W I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
50	2534.82	II	400	2678.88	I	50	2918.63	II	210 d	3266.62	I
580	2545.34	I	2100	2681.42	I	360	2923.10	I		3266.77	I
1200	2547.14	I	290	2683.35	I	230	2923.54	I	150	3281.94	I
50	2549.09	II	210	2691.09	I	230	2925.13	I	150	3293.71	I
40	2550.10	II	650	2695.67	I	690	2935.00	I	730	3300.82	I
780	2550.38	I	210	2697.71	II	2400	2944.40	I	440	3311.38	I
2700	2551.35	I	650	2699.59	I	2400	2946.99	I	440	3326.20	I
450	2553.82	I	400	2700.01	I	480	2947.39	I	440	3331.69	I
410	2554.86	II	40	2701.48	II	210	2952.29	II	150	3354.45	I
580	2555.09	II	160	2702.11	II	440	2964.52	I	150	3371.04	I
	2555.21	I	210	2702.52	I	480	2977.11	I	390	3373.75	I
310	2556.75	I	400	2706.58	I		2977.21	I	150	3412.96	I
290	2560.12	I	400	2708.59	I	730 d	2979.71	I	150	3413.53	I
730	2561.97	I	400 d	2708.80	I		2979.86	I	150	3422.42	I
230	2563.16	II		2708.93	I	400	2993.61	I	150	3427.71	I
110	2563.91	II	80	2709.58	II	240	2995.26	I	230	3429.59	I
530	2571.44	II	40	2710.78	II	190	3009.09	I	240	3443.00	I
170 d	2572.24	II	400	2715.50	I	360	3013.79	I	160	3477.94	I
	2572.35	II	80	2716.32	II	520	3016.47	I	400	3495.24	I
75	2573.95	II	80	2718.04	II	770	3017.44	I	160	3508.73	I
190	2579.26	II	2100	2718.91	I	110	3024.50	II	160	3510.02	I
290	2580.34	I	320	2719.33	I	210	3024.93	I	160	3526.85	I
870	2580.49	I	210	2719.86	I	310 d	3026.67	I	160	3535.54	I
40	2581.20	II	2600	2724.35	I		3026.79	I	160	3537.45	I
390	2584.39	I	210	2724.62	I	160	3033.56	I	650	3545.22	I
390	2589.17	II	400	2725.03	I	160	3034.19	I	160	3568.04	I
170	2591.49	II		2725.06	I	160	3039.31	I	240	3570.65	I
110	2598.74	II	80	2729.62	II	440 d	3041.73	I	80	3572.48	II
370	2601.96	I	75	2740.79	II		3041.86	I	160	3575.22	I
75	2602.51	II	650	2748.84	I	270	3043.80	I	80	3592.42	II
75	2603.02	II	40 d	2760.74	II	440	3046.44	I	240	3606.06	I
270	2603.54	I	80	2761.59	II	110	3048.66	I	80	3613.79	II
680	2606.39	I	400	2762.34	I	810	3049.69	I	1900	3617.52	I
320	2607.38	I	400	2764.27	II	110	3064.93	I	160	3622.34	I
370	2608.32	I	210	2768.98	I	180	3073.28	I	130	3627.24	I
970	2613.08	I	400	2769.74	I	110	3077.52	II	320	3631.94	I
480	2613.82	I	810	2770.88	I	180 d	3084.83	I	240	3641.41	II
230	2615.12	I	210	2773.70	I		3084.91	I	80	3646.52	II
70	2615.44	II	810	2774.00	I	370	3093.50	I	80	3657.59	II
210	2619.18	I	810	2774.48	I	240	3107.23	I	160	3675.55	I
400	2620.25	I	160	2776.50	II	240	3108.02	I	650	3682.08	I
400	2622.21	I	40	2778.69	II	230	3117.57	I	400	3683.30	I
400	2625.22	I	210	2787.98	I	260	3120.18	I		3683.39	I
210	2628.26	I	340	2791.96	I	160	3133.88	I	160	3683.93	I
400	2632.48	I	810	2792.70	I	130	3141.42	I	570	3688.06	I
400	2632.70	I	80	2799.03	II	65	3149.85	II	810	3707.92	I
810	2633.13	I	400	2799.93	I	290	3163.42	I	60	3716.08	II
290	2636.54	I	160 d	2801.05	II	130	3164.44	I	100	3719.39	I
400 d	2638.62	I		2801.17	I	130	3165.38	I	50	3736.22	II
	2638.75	I	130	2805.92	II	320	3176.60	I	120	3741.71	I
210	2645.69	I	40	2812.25	II	130	3179.06	I	510	3757.92	I
650	2646.18	I	810	2818.06	I	190	3181.82	I	680	3760.13	I
400	2646.73	I	160	2822.57	II	130	3184.05	I	1000	3768.45	I
75	2647.74	II	260	2829.82	I	130	3184.42	I	120	3769.21	I
40	2653.42	II	1600	2831.38	I	65	3189.24	II	120	3769.86	I
80	2653.57	II	810	2833.63	I	390	3191.57	I	340	3773.71	I
1600	2656.54	I	210	2835.64	I	390	3198.84	I	1000	3780.77	I
400	2657.38	I	400	2841.57	I	520	3207.25	I	170	3792.76	I
400 d	2658.04	II	810	2848.02	I	140	3208.28	I	290	3809.22	I
	2658.18	I	650	2856.03	I	1000	3215.56	I	190	3810.38	I
810	2662.84	I	650	2866.06	I	140	3221.21	I	260	3810.79	I
260	2664.97	I	230	2878.72	I	140	3221.91	I	1400	3817.48	I
75	2666.49	II	610	2879.11	I	190	3232.49	I	110	3829.13	I
210	2669.30	I	610	2879.40	I	140	3237.09	I	1100	3835.06	I
810	2671.47	I	440	2896.01	I	140	3242.03	I	290	3838.51	I
80	2673.59	II	1500	2896.44	I	140	3252.29	I	730	3846.22	I
650	2677.28	I	230	2910.48	I	210	3254.36	I	250	3847.49	I
160 d	2677.79	II	270	2911.00	I	140	3259.43	I	27	3851.57	II
	2677.91	I	360	2918.25	I	210	3259.66	I	150	3855.55	I

W I and II			W I and II			W I and II			W I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
150	3859.30	I	110	4269.77	I	13	5676.60	I	8	6828.43	I
180	3864.34	I	220	4274.55	I	15	5676.90	I	4	6853.74	I
1800	3867.99	I	160	4275.49	I	15	5697.79	I	4	6876.01	I
250	3872.84	I	160	4276.74	I	55	5735.09	I	5	6908.29	I
110	3874.41	I	110	4282.34	I	13	5749.24	I	9	6934.23	I
730	3881.41	I	110	4286.01	I	11	5756.10	I	8	6964.12	I
110	3892.72	I	110	4294.10	I	13	5793.06	I	13	6984.27	I
140 h	3897.91	I	4100	4294.61	I	13	5796.49	I	8	6993.27	I
150	3935.03	I	2200	4302.11	I	45	5804.85	I	4	6994.06	I
120	3936.97	I	160	4306.87	I	13 d	5806.05	I	8	7017.88	I
120	3947.98	I	110	4307.64	I		5806.24	I	3	7028.68	I
120	3952.52	I	110	4332.13	I	13	5833.61	I	3	7098.22	I
120	3952.90	I	100	4347.00	I	13	5838.97	I	4 h	7111.18	I
160	3953.15	I	150	4355.17	I	17	5845.27	I	15	7140.52	I
200	3955.30	I	100	4361.81	I	28	5851.58	I	9	7162.64	I
160	3965.14	I	150	4364.78	I	11	5856.61	I	5 h	7191.33	I
130	3968.59	I	100 d	4365.95	I	22	5864.63	I	5	7198.62	I
150 h	3970.80	I		4366.07	I	11	5874.22	I	11	7200.16	I
130	3979.29	I	150	4372.52	I	13	5880.21	I	5	7216.35	I
130	3980.64	I	200	4378.48	I	13	5891.61	I	4	7226.06	I
250	3983.29	I	180	4384.85	I	13	5901.20	I	8	7237.12	I
8600	4008.75	I	100	4403.95	I	40	5902.64	I	5	7274.47	I
540	4015.22	I	200	4408.28	I	13	5928.58	I	10	7278.24	I
170 h	4016.52	I	130	4412.19	I	55	5947.57	I	15	7285.81	I
220	4019.23	I	160	4436.90	I	13	5953.96	I	15	7296.55	I
130	4022.12	I	140	4460.49	I	13	5956.19	I	3	7298.25	I
180	4028.79	I	140	4466.34	I	27	5960.83	I	7	7385.08	I
180	4036.86	I	140	4466.74	I	55	5965.86	I	4	7451.39	I
140	4039.85	I	640	4484.19	I	27	5972.51	I	3	7456.37	I
140 h	4044.28	I	160	4504.84	I	20	5978.86	I	8	7483.35	I
910	4045.59	I	130	4512.88	I	20	5983.82	I	7	7504.13	I
180	4064.79	I	120	4513.25	I	13	6009.01	I	10	7509.00	I
150	4069.79	I	150	4543.54	I	55	6012.78	I	3	7520.66	I
730	4069.95	I	150	4546.47	I	40	6021.52	I	9	7537.45	I
340	4070.61	I	150	4551.82	I	20	6028.32	I	9	7550.48	I
100	4071.93	I	140	4570.64	I	20	6043.31	I	17	7569.92	I
5000	4074.36	I	170	4588.73	I	13	6049.92	I	5	7582.88	I
150	4082.96	I	140	4599.94	I	13	6065.08	I	3	7612.18	I
130	4088.33	I	140	4609.89	I	22	6081.44	I	17	7614.15	I
100	4095.69	I	160	4613.30	I	13	6111.66	I	3	7631.29	I
1000	4102.70	I	100	4642.53	I	13	6115.52	I	3	7654.81	I
150	4109.75	I	130	4657.42	I	22	6128.25	I	13	7688.97	I
100	4111.82	I	640	4659.87	I	13	6143.94	I	4	7701.01	I
150	4118.05	I	640	4680.51	I	20	6153.72	I	5	7761.16	I
100	4118.19	I	100	4693.72	I	20	6154.87	I	3	7776.73	I
100	4120.85	I	140	4757.54	I	20	6203.51	I	11	7784.15	I
100	4125.16	I	790	4843.81	I	20	6254.28	I	7	7808.96	I
150	4126.80	I	380	4886.90	I	27	6285.88	I	2	7823.82	I
100	4133.48	I	220	4982.59	I	45	6292.02	I	4	7863.47	I
540	4137.46	I	330	5006.15	I	20	6303.21	I	2	7867.04	I
150	4138.02	I	220	5015.30	I	13	6386.47	I	4	7880.40	I
110	4142.25	I	820	5053.28	I	35	6404.21	I	5	7886.48	I
140	4145.16	I	210	5054.60	I	40	6445.12	I	9	7940.92	I
110	4145.95	I	210	5069.12	I	11	6508.05	I	3	7957.06	I
160	4154.66	I	120	5071.74	I	15	6532.39	I	22	8017.19	I
160	4170.53	I	770	5224.66	I	13	6538.11	I	7	8054.89	I
450	4171.17	I	27	5500.49	I	13	6563.20	I	22	8055.64	I
160	4204.40	I	27	5503.44	I	20	6573.93	I	5	8060.38	I
220	4207.05	I	10	5508.61	I	11	6607.13	I	13	8123.82	I
110	4215.38	I	220	5514.68	I	11	6609.05	I	5	8143.19	I
250	4219.37	I	15	5531.38	I	17	6611.62	I	3	8165.72	I
110	4222.04	I	15	5537.72	I	11	6621.74	I	5	8210.22	I
150	4234.34	I	13	5568.09	I	13	6678.42	I	4	8322.05	I
290	4241.44	I	13	5604.31	I	15	6693.08	I	10	8338.08	I
540	4244.36	I	11	5631.27	I	5	6746.56	I	4	8348.81	I
290	4259.35	I	27	5631.94	I	5	6764.45	I	7	8358.72	I
200	4260.29	I	65	5648.37	I	7	6805.31	I	3	8382.94	I
200	4263.30	I	35	5660.72	I	9	6814.92	I	4	8402.60	I
1400	4269.38	I	27	5674.39	I	9	6820.27	I	4	8475.14	I

W I and II

Intensity	Wavelength	
27	8585.11	I
10	8594.42	I
8	8613.27	I
3	8614.50	I
13	8865.53	I

URANIUM (U)

Z = 92

U I and II

Refs. 1,303 – J.G.C.

Air

Intensity	Wavelength	
440	2565.41	II
340	2569.71	II
340	2591.25	II
610	2635.53	II
470	2645.47	II
340	2669.17	II
470	2683.28	II
320	2691.04	II
370	2706.95	II
370	2733.97	II
470	2754.16	II
340	2762.85	II
390	2770.04	II
410	2784.45	II
830	2793.94	II
870	2802.56	II
630	2807.05	II
440	2808.98	II
630	2817.96	II
870	2821.12	II
390	2824.37	II
680	2828.90	II
920	2832.06	II
360	2837.19	II
460	2839.89	II
360	2842.09	II
360	2849.48	II
390	2860.47	II
970	2865.68	II
340	2870.97	II
490	2882.74	II
460	2887.25	II
410	2888.26	II
1200	2889.62	II
320	2894.14	II
410	2894.51	II
780	2906.80	II
780	2908.28	II
320	2914.25	II
360	2914.63	II
440 p	2921.68	II
320	2927.38	II
490	2928.60	II
580	2931.41	II
440	2932.61	II
340	2933.86	II
530 p	2940.37	II
1300	2941.92	II
830	2943.90	II
340	2948.09	II
390	2954.77	II
580	2956.06	II
460	2965.03	II
580	2967.94	II
580	2971.06	II
410	2976.35	II

U I and II

Intensity	Wavelength	
320	2982.74	II
530	2984.61	II
410	2992.72	II
360	3007.91	II
320	3021.22	II
630	3022.21	II
320	3024.51	II
320	3028.19	II
630	3031.99	II
490	3033.18	II
490	3044.16	II
580	3050.20	II
630	3057.91	II
460	3061.62	II
630	3062.54	II
580	3072.78	II
580	3093.01	II
320	3095.75	II
320	3098.01	II
580	3102.39	II
460	3104.15	II
970	3111.62	II
530	3119.35	II
680	3124.95	II
530	3139.61	II
410	3144.97	II
490	3145.56	II
680	3149.24	II
530	3153.11	II
340	3176.21	II
340	3177.33	II
340	3206.05	II
730	3229.50	II
680	3232.16	II
440	3244.22	II
340	3265.79	II
440	3270.12	II
440	3288.21	II
730	3291.33	II
1100	3305.89	II
390	3337.79	II
440	3341.66	II
390	3357.84	I
730	3390.38	I
340	3394.77	II
580	3424.56	II
580	3435.49	I
360	3453.55	II
320	3454.23	II
320	3457.05	II
320	3457.71	II
360	3459.92	I
320	3462.22	I
460	3463.55	I
630	3466.30	I
390	3472.52	II
320	3473.43	I
360	3480.36	I
680	3482.49	II
1600	3489.37	I
390	3493.33	II
340	3494.00	I
320	3494.84	II
530	3496.41	II
630	3500.08	I
320	3504.01	I
320	3505.07	II
780	3507.34	I
320	3508.84	II

U I and II

Intensity	Wavelength	
1600	3514.61	I
390	3509.66	II
320	3513.67	I
390	3519.96	II
390	3531.11	II
630	3533.57	II
320	3534.33	I
530	3540.47	II
320	3542.57	I
390	3547.19	II
320	3549.20	I
1200	3550.82	II
320	3552.17	II
680	3555.32	I
320	3561.41	I
1200	3561.80	I
390	3563.66	I
2300	3566.59	I
530	3569.08	I
320	3574.76	I
360	3577.92	I
630	3578.72	II
360	3581.84	II
3200	3584.88	I
320	3590.50	II
390	3591.74	I
460	3593.52	II
460	3605.27	I
360	3606.32	II
320	3616.33	I
320	3616.76	II
320	3620.08	I
320	3622.70	I
390	3623.06	II
460	3630.73	II
840	3638.20	I
310	3640.76	II
420	3644.24	I
310	3645.03	II
660	3651.54	I
490	3652.06	I
960	3659.15	I
2800	3670.07	II
380	3678.75	II
540	3691.92	II
330	3693.70	II
540	3700.57	II
1100	3701.52	II
350	3713.55	I
300	3717.42	II
350	3718.11	II
350	3729.82	II
350	3732.62	II
350	3733.07	II
600	3738.04	II
300	3744.25	II
680	3746.42	II
350	3747.14	II
950	3748.68	II
600	3751.17	I
350	3752.66	II
350	3755.48	II
490	3758.35	I
350	3759.24	II
330	3763.26	I
490	3764.57	II
430	3766.89	I
330	3769.53	II
540	3773.43	I

U I and II

Intensity	Wavelength	
300	3776.48	I
380	3780.71	II
1900	3782.84	II
430	3783.84	II
570	3793.10	II
380	3793.26	I
380	3793.57	II
380	3808.92	I
380	3809.22	II
1900	3811.99	I
380	3813.79	II
380	3814.06	II
750	3826.51	II
2000	3831.46	II
1200	3839.63	I
490 p	3848.60	II
620	3854.22	I
2400	3854.64	II
4900	3859.57	II
490	3861.17	II
1900	3865.92	II
380	3866.80	II
1500	3871.03	I
620	3874.04	II
620	3878.08	II
1000	3881.45	II
490	3882.36	II
380	3883.28	II
2200	3890.36	II
620	3892.68	II
490	3894.12	I
490	3896.77	II
620	3899.78	II
410	3902.55	II
460	3904.30	II
380	3906.45	I
330	3911.67	II
380	3915.88	II
330	3926.21	I
330	3926.72	I
430	3930.98	II
2000	3932.02	II
490	3935.38	II
330	3940.48	II
1200	3943.82	I
300	3948.44	I
300	3953.58	II
360	3954.67	II
350	3964.21	I
600	3966.52	II
1200	3985.79	II
460	3990.42	II
380	3992.53	II
350	3998.24	II
350	4004.06	II
430	4005.21	I
570	4017.72	II
300	4018.99	II
1000	4042.75	I
520	4044.41	II
410	4047.61	I
1600	4050.04	II
540	4051.91	II
300	4054.30	II
430	4058.19	II
880	4062.54	II
520	4067.75	II
410	4071.12	II
300	4074.48	II

U I and II			U I and II			U I and II			V I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
330	4076.69	II	90	6077.29	I	100	13185.16	I	110	2564.82	I
330	4080.60	II	28	6087.34	II	75	13306.23	I	230	2574.02	I
2200	4090.13	II	40	6171.86	I	100	13961.58	I	140	2630.67	II
460	4093.03	II	35	6175.39	I	50	16906.00	I	130	2642.21	II
380	4106.38	II	28	6280.18	II	50	17451.11	I	150	2645.26	I
810	4116.10	II	28	6359.29	I	50	18136.65	I	140	2651.90	I
410	4124.73	II	55	6372.46	I	50	18366.96	I	150	2656.22	I
410	4128.34	II	28	6378.52	II	75	18634.43	I	180	2661.42	I
460	4141.22	II	28	6392.77	I	25	19029.39	I	290	2672.00	II
880	4153.97	I	90	6395.42	I	10	20201.13	I	380	2677.80	II
380	4156.65	I	110	6449.16	I	10	20271.41	I	270	2678.57	II
350	4163.68	II	35	6464.98	I	10	20374.13	I	380	2679.32	II
1400	4171.59	II	90	6826.92	I	10	20517.29	I	180	2682.87	II
300	4189.27	II	35	6876.74	II	10	20690.64	I	180	2683.09	II
350	4222.37	I	23	7074.79	I	10	20772.19	I	1100	2687.96	II
1000	4241.67	II	27	7101.61	I	10	21008.38	I	170	2688.72	II
520	4244.37	II	30	7128.90	I	10	21099.98	I	150	2689.88	II
680	4341.69	II	16	7147.89	I	10	21112.14	I	230	2690.24	II
430 h	4355.74	I	16	7254.45	I	20	21144.90	II	240	2690.79	II
430	4362.05	I	23	7425.50	I	10	21674.51	I	120	2696.99	I
330	4393.59	I	45	7533.93	I	10	21693.38	I	120	2697.74	I
600	4472.33	II	16	7619.35	I	75	21910.22	I	680	2700.94	II
240	4515.28	II	50	7881.94	I	10	22110.73	I	380	2702.19	II
620	4543.63	II	18	7970.46	I	10	23156.76	I	530	2706.17	II
300	4620.21	I	16	8174.66	I	10	23948.19	I	150	2706.70	II
240	4627.07	II	18	8262.06	I	10	29557.07	I	110	2707.86	II
210	4631.62	I	16	8318.35	I				170	2711.74	II
220	4646.60	II	16	8337.50	II		**VANADIUM (V)**		120	2714.20	II
140	4666.85	II	18	8381.87	I				640	2715.69	II
100	4671.40	II	16	8441.21	I		**Z = 23**		150	2722.56	I
170	4689.07	II	35	8445.39	I				240	2728.64	II
100	4702.51	II	18	8450.03	I		V I and II		180	2731.35	I
160	4722.72	II	16	8570.52	I		Ref. 1 - C.H.C.		100	2739.71	II
120	4731.59	II	75	8607.95	I		Air		140	2753.40	II
100	4755.74	II	23	8691.28	I	2100	2092.44	I	140	2765.67	II
150	4756.81	I	18	8710.76	I	40	2384.00	II	140	2777.73	II
100	4772.70	II	18	8753.69	I	40	2384.28	I	120	2803.47	II
100	4860.99	II	30	8757.76	I	60	2386.96	I	120	2846.57	I
110	5008.21	II	16	8951.96	I	60	2388.92	I	110	2847.57	II
170	5027.38	I	16	8989.92	I	75	2390.87	I	140	2852.87	I
70	5117.24	II	10	9093.67	I	75	2391.26	I	140	2854.34	II
80	5160.32	II	10	9139.56	I	85	2392.90	I	200	2855.22	I
55	5164.14	I	10	9201.51	I	70	2397.78	I	180	2859.97	I
55	5184.57	II	10	9265.34	I	70	2398.27	I	240	2864.36	I
45	5204.31	II	10	9276.44	I	70	2399.96	I	170	2866.59	I
45	5247.75	II	10	9385.90	I	120	2406.75	I	210	2868.10	I
45	5257.04	II	10	9653.26	I	110	2407.90	I	140	2869.13	II
70	5280.38	I	10	9819.00	I	120	2415.33	I	210	2870.55	I
55	5386.19	II	10	9819.05	I	120	2416.75	I	110	2877.69	II
80	5475.70	II	10	9868.36	I	100	2420.12	I	110	2879.16	II
70	5480.26	II	10	9932.76	I	100	2421.06	I	350	2880.03	II
70	5481.20	II	10	9964.11	I	100	2421.98	I	380	2882.50	II
45	5482.53	II	50	10157.91	I	110	2428.28	I	380	2884.78	II
160	5492.95	II	50	10259.55	I	110	2435.52	I	140	2888.25	II
70	5527.82	II	100	10554.93	I	140	2501.61	I	380	2889.62	II
70	5564.17	I	50	10799.78	I	150	2506.90	I	900	2891.64	II
45	5581.59	II	25	10823.93	I	240	2507.78	I	530	2892.44	II
55	5620.78	I	25	11095.77	I	180	2511.65	I	900	2892.66	II
70	5780.59	I	75	11167.84	I	180	2511.95	I	1400	2893.32	II
70	5798.53	II	50	11294.13	I	180	2517.14	I	360	2896.21	II
45	5836.02	I	100	11384.13	I	240	2519.62	I	110	2899.60	I
55	5837.68	II	25	11410.43	I	410	2526.22	I	360	2903.08	II
230	5915.39	I	50	11503.38	I	210	2527.90	II	150	2906.13	I
55	5971.50	I	25	11568.81	I	120	2528.47	II	900	2906.46	II
100	5976.32	I	20	11784.72	II	150	2528.84	II	490	2907.47	II
45	5997.31	I	100	11859.42	I	240	2530.18	I	2400	2908.82	II
28	6017.38	II	100	11908.83	I	110	2549.28	II	710	2910.02	II
55	6051.74	II	100	12250.46	I	120	2552.65	I	530	2910.39	II
45	6067.22	II	25	13088.28	I	210	2562.13	I	560	2911.06	II

V I and II			V I and II			V I and II			V I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
380	2914.93	I	530	3188.51	II	520	3790.32	I	120	4023.39	II
120	2917.37	II	750	3190.68	II	1100	3794.96	I	120	4031.83	I
210	2919.99	II	530	3198.01	I	570	3799.91	I	150	4035.63	II
380	2920.38	II	750	3202.38	I	570	3803.47	I	120	4042.64	I
710	2923.62	I	450	3205.58	I	190	3806.80	I	360	4050.96	I
2400	2924.02	II	450	3207.41	I	300	3807.50	I	360	4051.35	I
1700	2924.64	II	410	3212.43	I	520	3808.52	I	280	4057.07	I
710	2930.81	II	210	3217.11	II	230	3809.60	I	130	4057.82	I
210	2934.40	II	150	3237.87	II	1000	3813.49	I	230	4063.93	I
110	2935.87	I	140	3254.77	II	140 d	3817.84	I	230	4071.54	I
900	2941.37	II	140	3263.24	I	1300	3818.24	I	1100	4090.58	I
450	2941.49	II	1100	3267.70	II	230	3819.96	I	180	4092.41	I
230 d	2942.33	I	900	3271.12	II	230	3821.49	I	1800	4092.69	I
230	2943.20	I	750	3276.12	II	570	3822.01	I	120	4093.50	I
1100	2944.57	II	110	3279.84	II	450	3822.89	I	890	4095.49	I
110	2946.53	I	140	3298.14	I	300	3823.21	I	2800	4099.80	I
230	2949.63	I	110	3329.86	I	1700	3828.56	I	590	4102.16	I
300	2950.35	II	110	3365.55	I	280	3834.22	I	230	4104.40	I
640	2952.08	II	110	3377.62	I	160	3839.00	I	260	4104.78	I
120	2954.33	I	170	3400.40	I	110	3839.38	I	2800	4105.17	I
260	2957.52	II	110	3425.07	I	570	3840.44	I	120	4108.22	I
410	2962.77	I	110	3485.92	II	2600	3840.75	I	2300	4109.79	I
600	2968.38	II	210	3504.44	II	110	3841.89	I	8900	4111.78	I
120	2972.25	II	560	3517.30	II	380	3844.44	I	120	4112.33	I
120	2976.20	II	150	3520.02	II	320	3847.33	I	230	4113.52	I
380	2976.52	II	110	3524.72	II	110	3849.32	I	4300	4115.18	I
240	2977.54	I	230	3529.74	I	1200	3855.37	I	1800	4116.47	I
260	3001.20	II	230	3530.77	II	3000	3855.84	I	180	4118.18	I
140	3014.82	II	560	3533.68	I	150	3862.22	I	180	4118.64	I
180	3016.78	II	110	3543.50	I	130	3863.87	I	230	4119.46	I
270	3033.45	II	560	3545.20	II	1300	3864.86	I	180	4120.54	I
290	3033.82	II	110	3553.27	I	230	3867.60	I	180	4123.19	I
230	3043.12	I	560	3556.80	II	170	3871.08	I	2000	4123.57	I
230	3043.56	I	110	3566.18	I	1500	3875.08	I	120	4124.07	I
230	3044.94	I	560	3589.76	II	420	3875.90	I	3100	4128.07	I
230	3048.22	II	490	3592.02	II	570	3876.09	I	120	4128.86	I
170	3050.89	I	560	3592.53	I	130	3878.71	II	3100	4132.02	I
180	3053.39	II	270	3593.33	II	700	3890.18	I	2300	4134.49	I
450	3053.65	I	110	3606.69	I	460	3892.86	I	150	4159.69	I
1200	3056.33	I	110	3639.02	I	280 h	3898.02	I	100	4174.01	I
1400	3060.46	I	110	3644.71	I	140	3899.13	II	230	4179.42	I
140	3063.25	II	250	3663.59	I	140 h	3900.18	I	150	4182.59	I
2400	3066.38	I	250	3667.74	I	140 h	3901.15	I	180	4189.84	I
200	3067.12	II	110	3669.41	II	2400	3902.25	I	180	4191.56	I
140	3069.64	I	170	3671.20	I	100	3906.75	I	230	4209.86	I
170	3073.82	I	280	3673.40	I	700	3909.89	I	120	4226.62	I
100	3075.27	I	280	3675.70	I	100	3910.79	I	360	4232.46	I
150	3082.11	I	170	3676.68	I	220	3912.21	I	180	4232.95	I
3800	3093.11	II	300	3680.11	I	140	3914.33	II	180	4234.00	I
200	3094.20	II	570	3683.13	I	100	3916.41	II	120	4235.76	I
180	3100.94	II	190	3686.26	I	100	3920.49	I	100	4257.37	I
3000	3102.30	II	470	3687.47	I	100	3921.90	I	120	4259.31	I
2600	3110.71	II	1300	3688.07	I	230	3922.43	I	120	4262.16	I
2000	3118.38	II	1000	3690.28	I	240	3924.66	I	560	4268.64	I
380	3121.14	II	1500	3692.22	I	150	3925.24	I	460	4271.55	I
150	3122.90	II	450	3695.34	I	200	3927.93	I	460	4276.96	I
1500	3125.28	II	1000	3695.86	I	260	3930.02	I	430	4284.06	I
260	3126.22	II	3800	3703.58	I	150	3931.34	I	330	4291.82	I
530	3130.27	II	1800	3704.70	I	260	3934.01	I	220	4296.11	I
410	3133.33	II	570	3705.04	I	150	3935.14	I	170	4297.68	I
210	3134.93	II	130	3708.72	I	100	3936.28	I	170	4298.03	I
150	3136.51	II	320	3715.47	II	150	3943.66	I	170	4306.21	I
150	3139.74	II	250	3727.34	II	100	3950.23	I	140	4307.18	I
200	3142.48	II	280	3732.76	II	140	3951.97	II	170	4309.80	I
150	3145.34	II	150	3734.43	I	100	3973.64	II	460	4330.02	I
3200	3183.41	I	230	3745.80	II	540	3990.57	I	510	4332.82	I
5300	3183.98	I	210	3750.87	II	260	3992.80	I	760	4341.01	I
3800	3185.40	I	210	3770.97	II	430	3998.73	I	1000	4352.87	I
410	3187.71	II	270	3778.68	I	170	4005.71	II	130	4354.98	I

V I and II			V I and II			V I and II			V I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
150	4355.94	I	35	4715.89	I	11	5397.87	I	28	6002.31	I
150	4368.04	I	55	4717.69	I	100	5401.93	I	55	6002.63	I
140 d	4373.23	I	40	4721.51	I	140	5415.26	I	28	6016.12	I
100	4375.30	I	40	4722.86	I	28	5418.09	I	20	6025.41	I
12000	4379.24	I	40	4729.53	I	50	5424.08	I	450	6039.73	I
100	4380.55	I	27	4730.38	I	40	5434.18	I	100	6058.14	I
7000	4384.72	I	27	4742.63	I	11	5437.66	I	20	6067.26	I
4800	4389.97	I	24	4746.63	I	17	5458.12	I	480	6081.44	I
3600	4395.23	I	40	4748.52	I	13	5471.33		1300	6090.22	I
1400	4400.58	I	45	4750.98	I	25	5487.22	I	28	6106.98	I
2300	4406.64	I	35	4751.56	I	85	5487.92	I	280	6111.67	I
2800	4407.64	I	40	4753.93	I	25	5489.94	I	600	6119.52	I
3600	4408.20	I	65	4757.48	I	28	5504.87	I	20	6128.34	I
4600	4408.51	I	55	4766.63	I	70	5507.75	I	280	6135.38	I
140	4412.14	I	130	4776.36	I	14	5511.18	I	180	6150.15	I
640	4416.47	I		4776.52	I	23	5545.93	I	85	6170.36	I
120	4419.94	I	110	4786.51	I	70	5547.07	I	23	6189.35	I
640	4421.57	I	130	4796.92	I	35	5558.75	I	450	6199.19	I
460	4426.00	I	19	4799.77	I	28	5561.66	I	130	6213.87	I
120	4427.31	I	130	4807.53	I	140	5584.50	I	450	6216.37	I
310	4428.52	I	130	4827.45	I	23	5586.00	I	28 h	6218.31	I
230	4429.80	I	150	4831.64	I	100	5592.42	I	130	6224.50	I
430	4436.14	I	120	4832.43	I	28	5601.38	I	430	6230.74	I
640	4437.84	I	19	4833.02	I	70	5604.94	I	100	6233.20	I
830	4441.68	I	19	4848.81	I	13	5624.20	I	55	6240.13	I
640	4444.21	I	320	4851.48	I	200	5624.60	I	170	6242.81	I
610	4452.01	I	35	4862.61	I	70	5624.89	I	710	6243.10	I
410	4457.48	I	480	4864.74	I	55	5626.01	I	280	6251.82	I
120	4457.76	I	21	4871.26	I	400	5627.64	I	85	6256.90	I
1000	4459.76	I	620	4875.48	I	13	5632.46	I	85	6258.57	I
2000	4460.29	I	55	4880.56	I	10	5633.90	I	55	6261.22	I
610	4462.36	I	740	4881.56	I	13	5635.51	I	85	6266.32	I
120	4468.01	I	27	4891.60	I	85	5646.11	I	130	6268.82	I
380	4469.71	I	21	4894.21	I	110	5657.44	I	170	6274.65	I
120	4474.04	I	55	4900.62	I	110	5668.36	I	17 h	6282.33	I
200	4474.71	I	95 d	4904.29	I	310	5670.85	I	200	6285.16	I
380	4488.89	I		4904.34	I	20	5683.22	I	200	6292.83	I
100	4496.06	I	85	4925.65	I	1200	5698.52	I	170	6296.49	I
120	4501.95	I	35	4932.03	I	920	5703.56	I	28 h	6311.50	I
140	4524.22	I	23	4966.12	I	570	5706.98	I	14	6324.66	I
360	4545.39	I	70	5002.33	I	11	5708.95	I	70	6326.84	I
100	4549.65	I	85	5014.62	I	11 h	5716.21	I	55	6339.09	I
280	4560.71	I	28	5051.63	I	70	5725.64	I	50	6349.48	I
200	4571.78	I	35	5064.12	I	850	5727.03	I	14	6355.58	I
510	4577.17	I	35	5105.14	I	170	5727.66	I	50	6357.30	I
140	4578.73	I	110	5128.53	I	230	5731.25	I	25	6358.82	I
640	4580.40	I	110	5138.42	I	40	5734.01	I	35	6361.27	I
830	4586.36	I	25	5139.53	I	230	5737.06	I	23	6379.36	I
170	4591.22	I	70	5148.72	I	110	5743.45	I	14	6393.28	I
1300	4594.11	I	40	5159.35	I	17	5747.70	I	35	6430.47	I
100	4606.15	I	23	5169.94	I	40	5748.87	I	23	6431.63	I
30	4609.65	I	70	5176.77	I	17	5752.74	I	14	6433.18	I
25	4611.74	I	20	5192.01	I	17	5761.41	I	11	6435.16	I
230	4619.77	I	110	5192.99	I	70	5772.42	I	70	6452.34	I
65	4624.41	I	23	5193.62	I	35	5776.64	I	11	6488.05	I
50	4626.48	I	110	5194.83	I	11	5782.61	I	55	6504.17	I
100	4635.18	I	55	5195.36	I	11	5783.50	I	110	6531.43	I
65	4640.07	I	20	5206.61	I	40 h	5784.38	I	28	6543.51	I
65	4640.74	I	40	5216.59	I	55 h	5786.16	I	17	6558.02	I
130	4646.40	I	35	5225.77	I	23	5788.56	I	11	6565.88	I
30	4648.89	I	35	5233.75	I	35 h	5807.14	I	50	6605.97	I
30	4666.14	I	110	5234.07	I	23	5817.06	I	15	6607.83	I
160	4670.49	I	20	5240.20	I	35 h	5817.53	I	10	6623.54	I
24	4684.45	I	110	5240.87	I	55 h	5830.72	I	50	6624.85	I
35	4686.92	I	17	5260.98	I	85 h	5846.30	I	13	6633.26	I
55	4706.16	I	40	5353.41	I	11	5850.32	I	13	6643.79	I
80	4706.57	I	35	5383.43	I	40	5924.57	I	8	6693.66	I
80	4710.56	I	40	5385.14	I	28	5978.91	I	8	6708.07	I
65	4714.12	I	14	5388.30	I	20	5980.78	I	65 c	6753.00	I

V I and II

Intensity	Wavelength	
10	6760.12	I
50 c	6766.49	I
40	6784.98	I
15	6786.32	I
26	6812.40	I
9 c	6829.94	I
15	6832.44	I
12	6839.58	I
12	6841.90	I
10 c	6870.88	I
8	6871.56	I
7	6894.00	I
12	6974.50	I
21	7026.07	I
7	7063.69	I
11 h	7092.08	I
6	7102.58	I
24	7148.15	I
7	7151.36	I
7	7182.08	I
14	7264.29	I
8	7321.44	I
40	7338.92	I
35	7356.54	I
11	7358.66	I
24	7361.39	I
12	7362.49	I
24	7363.16	I
9	7385.95	I
6 h	7393.49	
12 h	7485.90	I
12 h	7488.08	I
12 h	7492.44	
12 h	7578.75	I
9 h	7591.24	I
14 h	7596.92	I
12 h	7598.28	I
24	7624.81	I
5	7701.37	I
8	7704.81	I
8 h	7851.18	
14bl	7865.51	VO
12	7896.40	
14 h	7898.81	
24	7937.92	I
29 c	8027.39	I
14	8028.13	I
14 h	8035.38	
14 h	8045.71	
12	8051.89	
14	8093.48	I
8	8102.44	I
12	8108.59	I
9 h	8109.07	I
120cw	8116.80	I
11 h	8136.79	I
29	8144.59	I
9	8154.55	I
70 c	8161.07	I
14	8171.35	I
7	8180.21	I
35	8186.71	I
24	8187.33	I
29	8198.87	I
35	8203.07	I
24	8241.61	I
29 c	8253.51	I
29	8255.88	I
5 h	8280.39	I

V I and II

Intensity	Wavelength	
19	8282.37	I
8	8324.42	I
14 h	8331.23	I
14	8342.03	I
7	8402.81	I
12	8499.52	I
6	8534.49	I
6bl	8624.86	VO
60 c	8919.85	I
29 c	8932.93	I
12	8971.62	I

V III

Ref. 394 - C.H.C.

Vacuum

25	616.09	III
50	633.94	III
40	635.41	III
100	864.27	III
75	948.84	III
500	1006.46	III
500	1149.94	III
400	1157.18	III
300	1160.77	III
500	1252.11	III
400	1254.01	III
500	1287.87	III
400	1289.42	III
300	1290.77	III
400	1313.35	III
300	1313.27	III
500	1331.99	III
500	1335.12	III
1000	1643.03	III
1000	1650.14	III
300	1668.03	III
300	1670.66	III
300	1679.19	III
1000	1694.78	III
400	1721.98	III
300	1724.63	III
500 d	1751.68	III
500	1757.73	III
1000	1760.07	III
300	1773.43	III
400	1778.02	III
500	1779.72	III
400	1784.44	III
1000	1788.26	III
500	1793.82	III
1000	1794.60	III
300	1796.77	III
500	1798.15	III
300	1802.55	III
500	1804.13	III
1000	1812.19	III
400	1831.15	III
400	1831.64	III
300	1845.07	III
300	1850.69	III
400	1852.01	III
500	1854.42	III
300	1855.06	III
500	1856.64	III
300	1864.51	III
300	1878.68	III
400	1880.41	III
300	1895.01	III
400	1899.81	III

V III

Intensity	Wavelength	
500	1902.23	III
300	1934.00	III
	Air	
500	2232.91	III
400	2241.53	III
1000	2292.86	III
400	2314.18	III
500	2318.06	III
400	2319.00	III
500	2323.82	III
2500	2330.42	III
500	2331.75	III
400	2334.20	III
500	2343.10	III
500	2358.73	III
500	2366.31	III
2500	2371.06	III
1000	2382.46	III
500	2393.58	III
500	2404.18	III
500	2516.14	III
250	2521.16	III
250	2521.55	III
250	2548.21	III
150	2554.22	III
150	2563.32	III
250	2593.05	III
250	2595.10	III
100	3679.86	III
50 h	3705.35	III
40	4714.89	III
50	6597.20	III

V IV

Ref. 397 - C.H.C.

Vacuum

200	677.34	IV
60	678.74	IV
50	679.65	IV
500	684.37	IV
100	684.45	IV
100	691.53	IV
50	693.13	IV
400	737.85	IV
150	750.11	IV
60	1226.52	IV
50	1308.06	IV
80	1355.13	IV
60	1395.00	IV
50	1414.41	IV
80	1419.58	IV
100	1426.65	IV
60	1520.14	IV
80	1601.92	IV
80	1611.88	IV
80	1806.18	IV
60	1809.85	IV
100	1817.68	IV
200	1825.84	IV
300	1861.56	IV
500	1939.06	IV
400	1951.43	IV
300	1963.10	IV
500	1997.72	IV
200	1999.32	IV
	Air	
100	2002.48	IV
50 h	2088.74	IV
50 h	2146.83	IV

V IV

Intensity	Wavelength	
100 h	2155.34	IV
500	2268.30	IV
50 h	2421.32	IV
50 h	2433.53	IV
50 h	2446.80	IV
50 h	2450.87	IV
50 h	2556.92	IV
80 h	2570.72	IV
50 h	2624.21	IV
80 h	2645.54	IV
50 h	2655.41	IV
50 h	2656.87	IV
50	3284.56	IV
60	3334.79	IV
50	3448.41	IV
50	3496.42	IV
80 h	3514.25	IV
50 h	4985.65	IV
50 h	5130.78	IV
50 h	5262.16	IV
60 h	5352.32	IV
40 h	5940.12	IV

V V

Ref. 432 - C.H.C.

Vacuum

18	224.91	V
20	225.46	V
17	227.88	V
16	239.41	V
19	239.48	V
20	251.66	V
18	252.44	V
18	285.98	V
20	286.84	V
17	312.39	V
35	483.01	V
25	484.51	V
20	820.86	V
30	829.48	V
15	962.03	V
15	1142.74	V
25	1157.58	V
20	1490.11	V
100	1680.20	V
50	1716.72	V
15	1724.99	V
25	1792.99	V
30	1811.42	V
	Air	
20 d	2319.66	V
20	2577.90	V
15	2775.82	V
15	3617.97	V
12 d	3746.36	V
20	4200.32	V
15 w	4930.53	V
8	5356.07	V
7	6628.80	V
3	7595.51	V

XENON (Xe)

Z = 54

Xe I and II

Refs. 33,116,118,120,232 - S.P.D.

Vacuum

350	740.41	II

Xe I and II			Xe I and II			Xe I and II			Xe I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
350	803.07	II	150 l	4416.07	II	2000	6051.15	II	100	8029.67	I
600	880.80	II	500 h	4448.13	II	600	6093.50	II	200	8057.26	I
350	885.54	II	1000 h	4462.19	II	1500	6097.59	II	150	8061.34	I
600	925.87	II	500 l	4480.86	II	400	6101.43	II	100	8101.98	I
250	935.40	II	100 l	4521.86	II	100	6115.08	II	150 h	8151.80	II
800	972.77	II	600	4734.152	I	100	6146.45	II	100	8171.02	I
700	976.68	II	150	4792.619	I	150	6178.30	I	700	8206.34	I
500	1032.44	II	500	4807.02	I	120	6179.66	I	10000	8231.635	I
700	1037.68	II	400	4829.71	I	300	6182.42	I	500	8266.52	I
1100	1041.31	II	300	4843.29	I	500	6194.07	II	7000	8280.116	I
1000	1048.27	II	500	4916.51	I	100	6198.26	I	2000	8346.82	I
1200	1051.92	II	500	4923.152	I	100	6220.02	II	100	8347.24	II
2000	1074.48	II	200 l	4971.71	II	500	6270.82	II	2000	8409.19	I
600	1083.86	II	400	4972.71	II	400	6277.54	II	50 h	8515.19	II
1200	1100.43	II	300	4988.77	II	100	6284.41	II	200	8576.01	I
600	1158.47	II	100 l	4991.17	II	100	6286.01	I	50 h	8604.23	II
250	1169.63	II	200	5028.280	I	250	6300.86	II	250	8648.54	I
800 p	1183.05	II	200	5044.92	II	500	6318.06	I	100	8692.20	I
250	1192.04	I	1000	5080.62	II	400	6343.96	II	200	8696.86	I
600	1244.76	II	300	5122.42	II	600	6356.35	II	50 h	8716.19	II
250	1250.20	I	100	5125.70	II	200	6375.28	II	300	8739.39	I
1000	1295.59	I	100	5178.82	II	100	6397.99	II	100	8758.20	I
600	1469.61	I	300	5188.04	II	300	6469.70	I	5000	8819.41	I
	Air		400	5191.37	II	150	6472.84	I	300	8862.32	I
200	2864.73	II	100	5192.10	II	120	6487.76	I	200	8908.73	I
150 h	2895.22	II	500	5260.44	II	100	6498.72	I	200	8930.83	I
400	2979.32	II	500	5261.95	II	200 h	6504.18	I	1000	8952.25	I
100 h	3017.43	II	2000	5292.22	II	300	6512.83	II	100	8981.05	I
300	3128.87	II	300	5309.27	II	200	6528.65	II	200	8987.57	I
200 h	3366.72	II	1000	5313.87	II	100	6533.16	I	400	9045.45	I
2	3400.07	I	2000	5339.33	II	1000	6595.01	II	500	9162.65	I
2	3418.37	I	200	5363.20	II	100	6595.56	I	100	9167.52	I
2	3420.00	I	200	5368.07	II	400	6597.25	II	100	9374.76	I
3	3442.66	I	500	5372.39	II	100	6598.84	II	200	9513.38	I
100 h	3461.26	II	100	5392.80	I	150	6668.92	I	50 h	9591.35	II
4	3469.81	I	3000	5419.15	II	300	6694.32	II	150	9685.32	I
4	3472.36	I	800	5438.96	II	200	6728.01	I	50 l	9698.68	II
5	3506.74	I	300	5445.45	II	150	6788.71	II	100	9718.16	I
10	3549.86	I	200	5450.45	II	100	6790.37	II	2000	9799.70	I
10	3554.04	I	400	5460.39	II	1000	6805.74	II	3000	9923.19	I
15	3610.32	I	1000	5472.61	II	200	6827.32	I	100	10838.37	I
8	3613.06	I	100 l	5494.86	II	100	6872.11	I	90	11742.01	I
6	3633.06	I	200	5525.53	II	300	6882.16	I	375	12235.24	I
10	3669.91	I	600	5531.07	II	80	6910.22	II	100	12257.76	I
40	3685.90	I	100	5566.62	I	100	6925.53	I	300	12590.20	I
40	3693.49	I	300	5616.67	II	800 h	6942.11	II	2500	12623.391	I
100 l	3907.91	II	300	5659.38	II	100	6976.18	I	250	13544.15	I
100	4037.59	II	600	5667.56	II	2000	6990.88	II	2000	13657.055	I
200 l	4057.46	II	150	5670.91	II	150	7082.15	II	1250	14142.444	I
100 h	4098.89	II	100	5695.75	I	500	7119.60	I	800	14240.96	I
200 l	4158.04	II	200	5699.61	II	50 s	7147.50	II	375	14364.99	I
1000 h	4180.10	II	200	5716.10	II	200	7149.03	II	140	14660.81	I
500 h	4193.15	II	500	5726.91	II	500	7164.83	II	3000	14732.806	I
300 h	4208.48	II	500	5751.03	II	100	7284.34	II	100	15099.72	I
100 h	4209.47	II	300	5758.65	II	200	7301.80	II	2500	15418.394	I
300 h	4213.72	II	300	5776.39	II	200	7339.30	II	150	15557.13	I
100	4215.60	II	100	5815.96	II	100	7386.00	I	250	15979.54	I
300 h	4223.00	II	300	5823.89	I	150	7393.79	I	100	16039.90	I
400 h	4238.25	II	150	5824.80	I	300	7548.45	II	1000	16053.28	I
500 h	4245.38	II	100	5875.02	I	200	7584.68	I	125	16554.49	I
100 l	4251.57	II	300	5893.29	II	80	7618.57	II	1500	16728.15	I
500 h	4296.40	II	100	5894.99	I	500	7642.02	I	1500	17325.77	I
500 h	4310.51	II	200	5905.13	II	100	7643.91	I	350	18788.13	I
1000 l	4330.52	II	100	5934.17	I	200	7670.66	II	150	20187.19	I
200 h	4369.20	II	500	5945.53	II	60	7787.04	II	3000	20262.242	I
100 l	4373.78	II	300	5971.13	II	100	7802.65	I	250	21470.09	I
500 h	4393.20	II	2000	5976.46	II	100	7881.32	I	1250	23193.33	I
500 l	4395.77	II	200	6008.92	II	300	7887.40	I	110	23279.54	I
200 l	4406.88	II	1000	6036.20	II	500	7967.34	I	1800	24824.71	I

Xe I and II		
Intensity	Wavelength	
175	25145.84	I
2000	26269.08	I
2500	26510.86	I
250	28381.54	I
750	28582.25	I
300	29384.41	I
150	29448.06	I
100	29649.58	I
100	29813.62	I
600	30253.14	I
1500	30475.46	I
100	30504.12	I
500	30794.18	I
6000	31069.23	I
125	31336.01	I
550	31607.91	I
100	32293.08	I
1800	32739.26	I
3500	33666.69	I
150	34014.67	I
450	34335.27	I
170	34744.00	I
5000	35070.25	I
110	35246.92	I
250	36209.21	I
150	36231.74	I
450	36508.36	I
850	36788.83	I
140	38685.98	I
175	38737.82	I
270	38939.60	I
120	39955.14	I

Xe III		
Refs. 33,384,391,429 – R.L.K.		
Vacuum		
8	657.8	III
8	660.1	III
9	673.8	III
9	674.0	III
9	676.6	III
10	694.0	III
20	698.5	III
12	705.1	III
10	721.2	III
15	731.0	III
10	733.3	III
15	742.6	III
10	756.0	III
10	761.5	III
10	769.1	III
25	779.1	III
15	792.9	III
12	796.1	III
15	802.0	III
25	823.2	III
30	824.9	III
25	853.0	III
15	889.3	III
20	894.0	III
20	896.0	III
10	965.5	III
35	1003.4	III
35	1017.7	III
10	1047.8	III
12	1066.4	III
30	1130.3	III
25	1232.1	III

Xe III		
Intensity	Wavelength	
	Air	
80	2668.98	III
100	2717.33	III
30	2814.45	III
40	2815.91	III
30	2827.45	III
40	2847.65	III
30	2862.40	III
80 w	2871.10	III
60 w	2871.24	III
30	2871.7	III
30	2896.62	III
50	2906.6	III
40	2911.89	III
80 w	2912.36	III
40	2940.2	III
60	2945.2	III
40	2947.5	III
40	2948.1	III
80 w	2970.47	III
40	2992.87	III
30	3004.25	III
100	3023.81	III
40	3083.5	III
50	3091.1	III
30	3106.46	III
100 w	3138.3	III
80 c	3150.82	III
40	3185.2	III
100	3242.86	III
80	3268.98	III
30	3287.82	III
80 w	3301.55	III
40	3331.6	III
30	3358.0	III
80	3384.12	III
60	3444.2	III
70	3454.2	III
100 w	3458.7	III
40	3468.22	III
80	3522.83	III
50	3542.3	III
50	3552.1	III
40	3561.4	III
100	3579.7	III
80	3583.6	III
100 w	3595.4	III
100	3606.06	III
40	3607.0	III
100 w	3615.9	III
40	3623.1	III
600	3624.08	III
50	3676.67	III
40	3776.3	III
300	3781.02	III
100	3841.5	III
200	3877.8	III
60	3880.5	III
500	3922.55	III
300	3950.59	III
200	4050.07	III
60	4060.4	III
100	4109.1	III
100	4145.7	III
30	4285.9	III
50	4434.2	III
100 w	4462.1	III
100 w	4569.1	III
100 w	4570.1	III

Xe III		
Intensity	Wavelength	
100 w	4641.4	III
30	4673.7	III
60	4683.57	III
30	4723.60	III
100 w	4757.3	III
40	4869.5	III
60	5239.0	III
30	5367.1	III
50	5401.0	III
40	5524.4	III
60	6205.97	III
25	6221.7	III
60	6238.2	III
60	6259.05	III

YTTERBIUM (Yb)

Z = 70

Yb I and II		
Ref. 1 – C.H.C.		
Air		
2500	2116.67	II
3000	2126.74	II
370	2161.60	II
850	2185.71	II
640	2224.46	II
140	2320.81	II
50	2362.89	II
170	2390.74	II
18	2398.02	II
28	2421.35	II
25	2447.26	II
28	2460.25	II
460	2464.50	I
14	2484.89	II
70	2502.02	II
28	2505.48	II
11	2508.07	II
140	2512.06	II
18	2516.35	II
50	2522.44	II
65	2537.65	II
270	2538.67	II
14	2550.06	II
70	2552.15	II
55	2552.70	II
21	2565.57	II
28	2571.36	II
13	2573.15	II
18	2596.16	II
28	2596.32	II
21	2615.26	II
100	2617.01	II
55	2634.31	II
45	2639.45	II
85	2641.89	II
110	2644.31	II
28	2646.44	II
28	2647.46	II
28	2648.80	II
50	2649.79	II
28	2650.73	II
990	2653.75	II
35	2656.12	II
21	2659.27	II
200	2665.04	II
55	2668.75	II
390	2671.96	I

Yb I and II		
Intensity	Wavelength	
390	2672.66	II
21	2680.40	II
14	2683.42	II
70	2684.75	II
25	2687.98	II
28	2695.43	II
14	2696.62	II
18	2700.80	II
21	2708.84	II
65	2710.54	II
25	2711.78	II
55	2712.66	II
170	2718.35	II
21	2722.20	II
110	2732.74	II
21	2734.09	II
55	2741.71	II
55	2747.58	II
18	2748.04	II
230	2748.66	II
1300	2750.48	II
85	2751.45	II
21	2759.00	II
65	2760.78	II
65	2761.37	II
35	2764.41	II
85	2771.32	II
170	2776.28	II
100	2784.66	II
18	2787.96	II
45	2793.28	II
25	2794.44	II
21	2795.07	II
18	2795.29	II
35	2797.80	II
100	2798.21	II
45	2799.38	II
50	2800.00	II
35	2800.06	II
14	2810.72	II
65	2814.53	II
28	2816.32	II
140	2821.15	II
100	2824.97	II
190	2830.99	II
18	2832.20	II
28	2834.97	II
14	2842.59	II
230 h	2847.18	II
100	2848.44	II
21	2849.34	II
360	2851.13	II
55	2851.86	II
21	2853.41	II
18	2853.68	II
55	2854.14	II
45	2854.49	II
45	2858.33	II
45	2858.46	II
100	2859.39	II
430	2859.80	II
55	2860.39	II
140	2861.21	II
100	2861.34	II
200	2867.06	II
25	2870.06	II
45	2873.49	I
28	2885.97	II
70	2886.26	II

Yb I and II			Yb I and II			Yb I and II			Yb I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
200	2888.04	II	70	3093.87	II	500	3454.08	II	60 h	4430.21	I
3600	2891.38	II	28	3100.74	I	190 d	3458.29	II	440	4439.19	I
45	2893.62	II	45	3101.36	II		3458.39	I	85 h	4482.42	I
28	2896.90	II	28	3102.07	II	360	3460.27	I	85	4515.16	II
85	2899.70	II	55	3107.76	II	35	3462.34	II	35	4553.58	II
18	2902.41	II	170	3107.90	II	2400	3464.37	I	85 h	4563.95	I
21	2902.92	II	85	3115.34	II	500	3476.30	II	640	4576.21	I
21	2906.88	II	55	3116.70	II	500	3478.84	II	200	4582.36	I
28	2908.33	II	190	3117.81	II	50	3482.56	II	70	4589.21	I
35	2909.19	II	50	3136.76	II	85	3485.76	II	140	4590.83	I
55	2909.48	II	230	3140.94	II	85	3488.43	II	40	4598.36	II
85	2911.52	II	80	3141.73	II	100hw	3495.90	II	35	4683.81	II
18	2912.86	II	80	3145.06	II	85	3507.83	II	40	4684.27	I
170	2914.21	II	28	3145.54	II	50	3517.00	I	190	4726.08	II
140	2915.28	II	28	3153.18	II	230	3520.29	II	170 h	4781.87	I
18	2916.43	II	90	3153.88	II	50	3545.72	II	170	4786.61	II
280	2919.35	II	50	3155.18	II	100	3549.82	II	35	4816.43	I
55	2921.12	II	28	3162.29	I	35	3559.03	I	40	4820.24	II
45	2924.24	II	70	3163.80	II	200	3560.33	II	35	4836.96	II
25	2927.85	II	50	3165.21	II	170	3560.70	II	40	4837.46	I
35	2934.36	I	120	3169.06	II	50 h	3563.94	II	17	4851.15	II
55	2935.11	II	120	3180.92	II	85	3570.57	II	40 h	4894.60	I
21	2937.19	II	390	3192.88	II	50	3572.50	II	27	4912.36	I
45	2939.53	II	70	3198.65	II	50	3574.58	II	710	4935.50	I
45	2940.52	II	240	3201.16	II	360	3585.47	II	24	4937.22	II
28	2942.04	II	80	3217.18	II	130	3606.48	II	140	4966.90	I
140	2945.91	II	50	3218.32	II	50	3610.23	II	24	5009.52	II
45	2946.30	II	50	3225.88	II	70	3611.30	II	17	5067.30	II
18	2946.76	II	45	3239.20	II	200	3619.80	II	30	5067.80	I
28	2950.33	II	35	3239.58	I	110	3634.52		70	5069.14	I
45	2955.32	II	35	3246.06	II	240	3637.76	II	220	5074.34	I
18	2957.63	II	130	3261.51	II	70	3648.15	I	50	5076.74	I
65	2962.52	II	18000	3289.37	II	90	3655.73	I	20	5135.98	II
21	2963.26	II	130	3305.25	I	240	3669.69	II	14	5147.02	II
45	2963.46	II	140	3305.73	II	50	3670.69	II	20	5184.15	II
130	2964.76	II	50	3315.10	II	140	3675.08	II	60	5196.08	I
2000	2970.56	II	80	3319.41	I	50	3690.56	II	85	5211.60	I
45	2982.49	II	50	3333.06	II	32000	3694.19	II	35	5240.51	II
21	2982.66	II	240	3337.17	II	70	3698.60	II	100	5244.11	I
28	2983.70	II	280 d	3342.93	II	70	3700.58	I	40	5257.49	II
200	2983.99	II		3343.07	II	50	3710.34	II	150 h	5277.04	I
90	2985.08	II	80	3346.50		60	3724.21	II	35	5279.53	II
35	2985.88	II	50	3347.54	II	180	3734.69	I	17	5300.94	II
45	2990.37	II	35	3351.09	II	550	3770.10	I	170	5335.15	II
65	2991.87	II	50	3351.26		80	3774.32	I	30 d	5345.66	II
28	2993.94	II	100	3352.49	II	60 h	3791.74	I		5345.83	II
170	2994.80	II	100	3362.44	II	170	3839.91	I	60	5347.22	II
28	2995.86	II	50	3363.64	II	340	3872.85	I	30 h	5351.29	I
70	3000.46	II	240	3375.48	II	340	3900.85	I	150	5352.95	II
25	3002.61	II	50	3376.62	II	50	3904.81	II	30	5358.64	II
310	3005.77	II	28	3382.54		140	3911.27	I	30	5363.66	I
100	3009.39	II	140	3387.50	I	32000	3987.99	I	17	5389.84	II
65	3010.62	II	50	3390.25	II	930	3990.88	I	14	5432.71	II
55	3014.43	II	28	3390.42	II	50	4007.36	I	40	5449.27	II
160	3017.56	II	50	3391.10	II	70	4052.28	I	14	5478.50	II
160	3026.67	II	50 h	3394.44	II	85	4077.28	II	60	5481.92	I
920	3031.11	II	50	3401.01	II	440	4089.68	I	40	5505.49	I
55	3034.64	II	35	3404.10	II	120 h	4119.25	II	17	5524.54	I
25	3037.99	II	50	3412.45	I	70	4135.09	II	85 h	5539.05	I
55	3039.67	II	140	3418.39	I	470	4149.07	I	2400	5556.47	I
80	3042.65	II	360	3426.04	I	120	4174.56	I	35	5562.09	I
21	3044.00	II	80	3428.46	II	340	4180.81	II	20	5568.11	I
45	3046.48	II	240	3431.11	I	150 d	4218.56	II	20	5586.36	I
35	3047.05	II	45	3434.61	II		4218.69	I	40	5588.45	II
45	3063.12	II	50	3438.71	II	120	4231.97	I	60	5651.98	II
21	3063.67	II	100	3438.85	II	70	4277.74	I	7	5686.53	II
110	3065.04	II	35	3443.59		120	4305.97	I	220	5719.99	I
18	3076.01	II	35	3446.89	II	70	4316.95	II	10	5749.91	II
100	3089.10	II	85	3452.40	I	60 h	4393.69	I	10 h	5755.89	I

Yb I and II		
Intensity	Wavelength	
27	5771.66	II
10	5803.44	I
10	5819.41	II
35	5833.99	II
35	5837.14	II
27	5854.51	I
8	5897.21	II
20	5908.36	II
17	5989.33	I
40	5991.51	II
10	6052.88	II
10	6054.57	I
60	6152.57	II
30	6246.97	II
60	6274.78	II
14	6308.15	II
35 h	6400.35	I
35 h	6417.91	I
20	6432.73	II
17 h	6463.15	II
340	6489.06	I
20	6643.55	I
180	6667.82	I
15	6678.17	I
25	6727.61	II
25	6768.70	I
690	6799.60	I
18	6934.05	II
20	6999.88	II
10	7043.78	II
9 h	7244.41	I
8 h	7305.22	I
10 h	7313.05	I
16 h	7350.04	I
25	7448.28	I
30 h	7527.46	I
750	7699.48	I
7	7895.08	I
70 h	8922.56	II

Yb III		
Refs. 40,192 - J.R.		
Vacuum		
5	968.46	III
20	973.16	III
10	994.56	III
10	1560.66	III
80	1561.42	III
30	1669.60	III
50	1670.78	III
50	1719.82	III
60	1739.18	III
70	1762.80	III
80 h	1765.21	III
65	1775.29	III
70	1779.74	III
70	1781.31	III
20	1793.70	III
60	1798.85	III
65	1810.88	III
60	1826.41	III
20	1826.77	III
30	1838.01	III
30	1847.30	III
30	1849.24	III
10	1849.42	III
75	1852.36	III
75	1852.94	III
90	1854.80	III

Yb III		
Intensity	Wavelength	
80	1857.16	III
100	1863.32	III
5	1864.85	III
10	1867.23	III
10	1867.63	III
10	1868.19	III
5	1868.92	III
10	1870.07	III
15	1870.83	III
10	1871.15	III
200	1872.03	III
800	1873.91	III
100	1875.41	III
75	1875.92	III
70	1880.30	III
80	1884.22	III
70	1885.07	III
70	1887.22	III
10	1890.34	III
10	1890.87	III
15	1892.42	III
5	1895.50	III
100	1896.18	III
10	1897.57	III
500	1898.25	III
7	1906.74	III
10	1908.50	III
100	1909.66	III
70	1910.86	III
20	1920.53	III
10	1926.76	III
70	1928.09	III
15	1930.63	III
55	1942.59	III
40	1950.34	III
15	1962.80	III
80	1967.13	III
20	1969.47	III
30	1969.73	III
10	1973.96	III
10	1974.18	III
25	1976.46	III
2	1981.74	III
5	1983.88	III
25	1984.62	III
7	1985.74	III
80	1986.43	III
80 h	1989.82	III
50	1991.14	III
45	1995.05	III
55	1997.28	III
55	1997.66	III
500	1998.82	III
Air		
20	2054.80	III
10	2066.49	III
10	2073.64	III
30	2078.05	III
10	2087.37	III
50	2087.98	III
20	2091.23	III
20	2092.26	III
10	2094.77	III
80	2095.31	III
15	2096.79	III
30	2098.36	III
10	2106.71	III
50	2109.54	III
20	2119.18	III

Yb III		
Intensity	Wavelength	
20	2198.14	III
80	2202.27	III
300	2240.11	III
100	2244.28	III
200	2257.03	III
100	2262.26	III
200	2265.67	III
150	2282.99	III
100	2283.99	III
300	2305.32	III
100	2309.27	III
200	2314.49	III
200	2337.97	III
40	2361.08	III
200	2365.43	III
50	2367.46	III
30	2369.99	III
20	2377.22	III
50	2403.95	III
20	2410.04	III
60	2412.33	III
10	2429.18	III
20	2433.43	III
100	2438.27	III
20	2439.31	III
20	2440.43	III
10	2458.64	III
10	2464.59	III
200	2490.42	III
20	2491.69	III
40	2506.25	III
300	2516.82	III
15	2522.07	III
20	2529.14	III
40	2550.39	III
300	2555.29	III
100	2560.56	III
10	2561.66	III
100	2566.78	III
2000	2567.61	III
1000	2579.57	III
100	2588.62	III
20	2592.69	III
500	2597.23	III
800	2599.14	III
30	2609.14	III
600	2621.11	III
300	2627.07	III
30	2635.37	III
500	2638.06	III
300	2640.48	III
1000	2642.56	III
100	2643.62	III
1000	2651.74	III
700	2652.25	III
100	2659.98	III
70	2664.89	III
2000	2666.13	III
2000	2666.99	III
30	2673.33	III
500	2677.39	III
500	2691.01	III
30	2708.04	III
400	2712.32	III
500	2749.91	III
200	2755.94	III
200	2756.76	III
100	2765.50	III
300	2788.24	III

Yb III		
Intensity	Wavelength	
600	2795.60	III
400	2803.32	III
1000	2803.43	III
10	2807.22	III
50	2808.51	III
600	2816.92	III
1000	2818.72	III
15	2826.01	III
300	2842.96	III
400	2875.86	III
600	2898.30	III
1000	2906.31	III
300	2928.97	III
50	2977.84	III
800	2998.00	III
2000	3029.49	III
100	3031.62	III
30	3040.65	III
3000	3092.50	III
20	3102.18	III
4000	3126.01	III
1000	3138.58	III
100	3151.44	III
70	3179.34	III
800	3191.35	III
50	3216.27	III
2000	3228.58	III
2000	3325.51	III
50	3358.25	III
20	3364.30	III
2000	3384.01	III
150	3392.56	III
100	3397.66	III
80	3432.94	III
40	3456.18	III
150	3463.51	III
20	3469.98	III
300	3550.87	III
200	3613.89	III
30	3659.84	III
30	3663.74	III
200	3664.74	III
20	3675.78	III
400	3711.91	III
20	3879.98	III
10	3882.58	III
20	3887.17	III
150	3896.55	III
15	3912.75	III
20	3913.23	III
500	3931.23	III
100	3985.56	III
10	3991.74	III
10	3997.67	III
2000	4028.14	III
10	4033.03	III
20	4074.53	III
20	4090.67	III
20	4098.23	III
15	4121.06	III
10	4150.04	III
15	4153.11	III
100	4162.72	III
60	4172.95	III
30	4194.34	III
100	4194.95	III
10	4198.74	III
300	4213.64	III
10	4220.83	III

Yb III

Intensity	Wavelength	
15	4231.07	III
20	4289.64	III
40	4301.14	III
20	4304.01	III
15	4350.80	III
10	4380.07	III
100	4517.58	III
40	4639.14	III
10	4834.93	III
15	5054.94	III
20	5256.85	III
20	5331.54	III
15	5740.83	III
10 d	5949.02	III
20	5973.05	III
40	6055.85	III
100	6214.22	III
200	6328.52	III
10	6365.88	III
150	6378.33	III
25	6466.33	III
20	6985.15	III
10	7037.04	III
15	7157.72	III
10	7311.02	III
10	7399.98	III
80	7410.01	III
15	7456.86	III
70	7664.41	III
80	7892.39	III
20	7893.10	III
100	7971.46	III
20	8056.02	III
10	8117.44	III
10	8326.86	III
30	8327.88	III
20	8400.01	III
30	8489.90	III
200	10110.60	III
100	10830.36	III

Yb IV

Refs. 40,311 - J.R.

Vacuum

200	828.96	IV
200	870.35	IV
300	902.46	IV
300	927.01	IV
300	936.22	IV
400	943.04	IV
400	946.20	IV
200	975.21	IV
1000	1050.24	IV
1000	1054.46	IV
400	1092.51	IV
200	1109.96	IV
200	1110.55	IV
5000	1134.43	IV
300	1136.24	IV
500	1166.01	IV
600	1185.58	IV
200	1290.24	IV
600	1305.58	IV
900	1316.04	IV
200	1326.32	IV
800	1326.36	IV
200	1340.06	IV
300	1345.36	IV
900	1350.26	IV

Yb IV

Intensity	Wavelength	
200	1353.43	IV
400	1356.15	IV
200	1361.75	IV
300	1365.88	IV
300	1369.72	IV
400	1375.42	IV
300	1376.66	IV
200	1384.41	IV
250	1393.93	IV
350	1398.77	IV
400	1407.05	IV
300	1413.14	IV
400	1416.15	IV
400	1417.72	IV
200	1423.99	IV
300	1430.29	IV
200	1440.61	IV
400	1477.92	IV
300	1491.57	IV
400	1765.03	IV
200	1776.18	IV
200	1778.20	IV
200	1779.34	IV
300	1789.71	IV
800	1791.06	IV
200	1801.67	IV
250	1809.63	IV
600	1813.84	IV
400	1816.07	IV
250	1817.58	IV
300	1819.02	IV
200	1824.22	IV

Air

300	2106.48	IV
900	2116.65	IV
500	2121.29	IV
250	2122.84	IV
800	2123.32	IV
600	2125.72	IV
200	2129.65	IV
500	2135.21	IV
300	2137.58	IV
500	2138.35	IV
200	2138.53	IV
800	2139.99	IV
400	2141.04	IV
200	2142.20	IV
300	2143.42	IV
300	2143.89	IV
20000	2144.77	IV
400	2148.10	IV
300	2148.52	IV
15000	2154.18	IV
250	2165.55	IV
300	2169.12	IV
200	2172.16	IV
300	2177.53	IV
400	2183.32	IV
270 h	2186.13	IV
270	2187.17	IV
90 h	2189.90	IV
120	2193.34	IV
150	2198.27	IV
90	2224.64	IV
150	2231.28	IV
90	2233.30	IV
90	2244.20	IV
140	2331.36	IV

YTTRIUM (Y)

Z = 39

Y I and II

Ref. 1 - C.H.C.

Air

Intensity	Wavelength	
350	2243.06	II
50	2354.20	I
30	2373.83	
50	2385.24	
25	2413.93	II
560	2422.20	II
60	2460.61	II
25	2490.42	I
12	2540.28	
14	2547.57	
10	2550.17	
20	2681.65	I
60	2694.21	I
26	2695.39	I
95	2723.00	I
22	2730.08	I
22	2734.85	II
70	2742.53	I
140	2760.10	I
30	2785.21	II
12	2785.59	II
12	2791.20	I
30	2800.11	II
26	2813.64	I
18	2818.86	I
45	2822.56	I
22	2825.37	II
45	2826.38	II
70	2854.43	II
26	2856.30	II
11	2857.87	II
95	2886.48	I
18	2897.69	II
14	2898.82	II
160	2919.05	I
18 h	2930.03	II
390	2948.40	I
350	2964.96	I
18	2973.91	II
480	2974.59	I
30	2980.55	II
750	2984.26	I
70	2995.26	I
140	2996.94	I
70	3005.26	I
55	3018.95	I
130	3021.73	I
90	3022.28	I
26	3026.49	II
30	3036.59	II
45	3044.84	I
190	3045.37	I
22	3047.11	I
60	3055.22	II
60	3086.85	II
55 h	3091.70	I
22	3093.76	II
95	3095.88	II
45	3111.81	I
55	3112.04	II
22	3114.28	I
60	3128.77	II
80	3129.93	II

Y I and II

Intensity	Wavelength	
95	3135.17	II
110	3173.06	II
220	3179.41	II
70	3191.31	I
2300	3195.62	II
2200	3200.27	II
2200	3203.32	II
3900	3216.69	II
6200	3242.28	II
310	3280.91	II
19	3308.47	II
4700	3327.89	II
55	3340.38	I
160	3362.00	II
85	3388.59	I
45	3397.04	I
85	3412.47	I
200	3448.82	II
70	3450.95	I
110	3467.88	II
170	3485.73	I
1700	3496.09	II
80	3521.53	I
45	3546.01	II
3900	3549.01	II
130	3551.80	I
540	3552.69	I
170	3558.76	I
190	3571.43	I
260	3576.05	I
3300	3584.52	II
300	3587.75	I
100	3589.69	I
2800	3592.92	I
10000	3600.73	II
6200	3601.92	II
7800	3611.05	II
4300	3620.94	I
1900	3628.71	II
7800	3633.12	II
3000	3664.61	II
45	3668.49	II
170	3692.53	I
13000	3710.30	II
60	3718.12	I
60	3738.61	I
1200	3747.55	II
50	3749.89	I
10000	3774.33	II
1400	3776.56	II
50	3782.30	II
7400	3788.70	II
1300	3818.35	II
4000	3832.88	II
70	3847.87	II
80	3876.82	I
480	3878.28	II
30	3887.77	I
60 h	3904.59	I
50 h	3918.25	I
60 h	3930.11	I
240	3930.66	II
4400	3950.36	II
150	3951.60	II
60 h	3955.09	I
3600	3982.60	II
40	3987.50	I
940	4039.83	I
2400	4047.64	I

Y I and II			Y I and II			Y I and II			Y I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
9400	4077.38	I	95	4604.80	I	90	5424.37	I	120	6004.65	
90 h	4081.22	I	40	4613.00	I	190	5438.24	I	120	6009.19	I
2000	4083.71	I	2000	4643.70	I	710	5466.46	I	620bl	6019.87	YO
9900	4102.38	I	200 h	4658.32	I	100	5468.47	I	120	6023.41	I
60 h	4106.39	I	70	4658.89	I	90	5473.39	II	500bl	6036.60	YO
80	4110.81	I	85	4667.47	I	90	5480.74	II	420bl	6053.81	YO
320	4124.92	II	60	4670.82	I	60	5493.17	I	130bl	6072.78	YO
8900	4128.31	I	2000	4674.84	I	35	5495.59	I	50	6088.00	I
7500	4142.85	I	60	4678.35	I	240	5497.41	II	210bl	6089.35	YO
100 h	4157.63	I	260	4682.32	II	300	5503.45	I	160bl	6096.78	YO
2400	4167.52	I	85	4689.77	I	250	5509.90	II	130bl	6107.82	YO
2000	4174.14	I	180	4696.81	I	60	5513.64	I	130bl	6114.73	YO
8000	4177.54	II	35	4708.85	I	120	5521.63	I	75bl	6127.38	YO
120	4199.28	II	60	4725.85	I		5521.70	II	1400bl	6132.06	YO
380	4204.70	II	170	4728.53	I	24	5526.76	I	120	6135.04	I
80	4213.02	I	60 h	4732.37	I	740	5527.54	I	150	6138.43	I
40	4213.54	I	85	4741.40	I	35	5541.63	I	1100bl	6148.36	YO
160	4217.80	I	160	4752.79	I	120	5544.50	I	120	6151.72	YO
280 h	4220.63	I	410	4760.98	I		5544.61	II	820bl	6165.08	YO
80	4224.25	I	17	4780.18	I	90	5546.02	II	560bl	6182.23	YO
600	4235.73	II	120	4781.04	I	75	5556.43	I	1200	6191.73	I
2200	4235.94	I	160	4786.58	II	60	5567.75	I	590bl	6199.82	YO
300	4251.20	I	170	4786.89	I	180	5577.42	I	450bl	6217.96	YO
360 h	4302.30	I	180	4799.30	I	24	5581.08	I	300	6222.59	I
2800	4309.63	II	50	4804.31	I	620	5581.87	I	270bl	6236.72	YO
50	4316.30	I	70	4804.81	I	21	5590.96	I	45	6251.05	I
110	4330.78	I	85bl	4817.38	YO	21	5594.12	I	120bl	6275.01	YO
30	4337.29	I	140bl	4818.20	YO	120	5606.33	I	60 b	6295.46	YO
60	4344.65	I	140	4819.64	I	15	5623.91	I	24 b	6316.20	YO
440 h	4348.79	I	120	4822.13	I	560	5630.13	I	24 b	6338.10	YO
60	4352.33	I	190	4823.31	II	24	5632.25	I	15 b	6359.48	YO
60	4352.70	I	60	4839.15	I	21	5632.89	I	15	6369.87	YO
120	4357.73	I	770	4839.87	I	120	5644.69	I	75	6402.01	I
800	4358.73	II	550	4845.68	I	120	5648.47	I	1000	6435.00	I
120	4366.03	I	410	4852.69	I	740	5662.94	II	24	6437.18	I
12000	4374.94	II	120	4854.25	I	90	5675.27	I	18 h	6501.23	YO
150 h	4375.61	I	890	4854.87	II	18	5693.63	I	18 h	6518.33	YO
80	4379.33	I	50	4856.70	I	160	5706.73	I	18 h	6535.84	YO
30	4385.48	I	330	4859.84	I	24	5720.61	I	90	6538.60	I
100	4387.74	I	50	4879.65	I	75	5728.89	II	12 h	6553.84	YO
30	4394.01	I	1900	4883.69	II	150bl	5730.12	YO	70	6557.39	I
30	4394.67	I	50	4886.28	I	21	5732.09	I	12 h	6572.58	
1800	4398.02	II	40	4886.65	I	90	5743.85	I	35	6576.85	I
890	4422.59	II	95	4893.44	I	18bl	5746.93	YO	23	6584.87	I
80	4437.34	I	1100	4900.12	II	24bl	5764.22	YO	95	6613.75	II
100	4443.66	I	100	4906.11	I	75	5765.64	I	14	6622.49	I
130	4446.63	I	45	4909.00	I	35	5773.95	I	19 h	6636.49	I
20	4465.27	I	150	4921.87	I	100	5781.69	II	40	6650.61	I
40	4473.89	I	35	4930.93	I	15bl	5800.00	YO	21	6664.40	I
170	4475.72	I	45	4950.66	I	15bl	5818.58	YO	150	6687.58	I
180	4476.96	I	120	4974.30	I	30	5821.87	I	14 h	6691.83	I
160	4477.45	I	120	4982.13	II	21	5832.27	I	7	6694.75	I
110	4487.28	I	100	5006.97	I	9 b	5838.07	YO	16 h	6699.26	I
300	4487.47	I	75	5070.21	I	15	5858.83	YO	70	6700.71	I
30	4491.75	I	75	5072.19	I	15	5871.83	I	35	6713.20	I
25	4492.42	I	1100	5087.42	II	24	5876.14	YO	40	6735.99	I
500	4505.95	I	30	5088.18	I	24	5879.96	I	190	6793.71	I
50	4513.58	I	210	5119.11	II	24 b	5893.94	YO	70 h	6795.41	II
80	4514.01	I	450	5123.21	II	35	5902.96	I	12 h	6803.15	I
40 h	4522.05	I	180	5135.20	I	24 b	5912.19	YO	21	6815.16	I
890	4527.25	I	120	5196.43	II	24 b	5931.10	YO	14	6832.49	II
440	4527.80	I	960	5200.41	II	90bl	5939.08	YO	45	6845.24	I
100	4544.32	I	1500	5205.72	II	45	5945.72	I	14	6858.24	II
100	4559.37	I	180	5240.81	I	24	5950.02	I	29	6887.22	I
30	4564.39	I	60	5289.82	II	75 b	5956.41	YO	21	6896.00	II
60 h	4573.56	I	45	5320.78	II	1300bl	5972.04	YO	9	6908.26	I
35	4581.32	I	75	5380.62	I	50	5981.86	I	14	6933.52	I
30	4581.77	I	220	5402.78	II	1000bl	5987.64	YO	24 h	6950.31	I
130	4596.55	I	24	5417.03	I	740bl	6003.60	YO	10	6951.68	II

Y I and II

Intensity	Wavelength	
10	6958.04	I
24	6979.88	I
13 h	7008.97	I
10	7009.93	I
19 h	7035.18	I
29	7052.94	I
13 h	7054.28	I
9	7075.13	I
11	7127.92	I
35	7191.66	I
10 h	7195.93	I
35	7264.17	II
9 h	7293.08	I
9 h	7330.62	I
5	7332.96	II
50	7346.46	I
11 h	7398.77	I
29	7450.30	II
17	7494.88	I
7 h	7536.71	I
35	7563.13	I
8 h	7617.72	I
19 h	7622.94	I
7	7652.89	I
5	7689.49	I
8 h	7698.00	I
19	7719.89	I
19	7724.08	I
13	7788.42	I
13	7796.32	I
6	7802.52	I
17	7812.16	I
29	7855.52	I
110	7881.90	II
10 h	7999.33	I
9	8329.61	I
24	8344.43	I
8 h	8365.64	I
17	8450.36	I
8 h	8528.94	I
95	8800.62	I
19 h	8835.85	II

Y III

Ref. 77 - J.R.

Vacuum

1	643.68	III
4	646.69	III
6	653.87	III
10	656.98	III
25	668.74	III
40	671.98	III
100	691.72	III
4	693.85	III
200	695.20	III
9	727.91	III
4	728.47	III
2	728.83	III
20	729.73	III
600	730.49	III
15	732.70	III
800	734.36	III
15	770.78	III
10	771.79	III
20	804.26	III
5000	805.20	III
75	806.18	III
150	808.97	III
7000	809.92	III

Y III

Intensity	Wavelength	
100	855.64	III
60	857.82	III
25	984.23	III
15	987.96	III
15000	989.21	III
25000	996.37	III
20	999.19	III
150	1000.56	III
25	1003.35	III
1000	1006.58	III
1200	1007.86	III
120	1077.52	III
500	1081.35	III
75 p	1084.63	III
350 p	1088.39	III
250	1095.25	III
25	1095.87	III
150	1103.21	III
3000	1289.74	III
2500	1306.96	III
5000	1314.51	III
1500	1316.10	III
4000	1334.04	III
8	1549.08	III
15 p	1553.81	III
30	1635.14	III
75	1640.43	III
200	1779.80	III
600	1786.05	III

Air

10	2041.93	III
5	2042.07	III
1500	2060.58	III
4000	2068.98	III
10000	2127.98	III
16000	2191.16	III
8000	2200.76	III
8000	2206.03	III
150	2261.41	III
80	2261.57	III
10000	2284.34	III
3	2319.92	III
10000	2327.31	III
50000	2367.23	III
40000	2414.64	III
100 p	2710.30	III
90 h	2710.54	III
5	2780.11	III
70	2791.44	III
20	2803.27	III
100	2807.00	III
90000	2817.04	III
6000	2867.67	III
6000	2913.41	III
1500	2917.74	III
1600	2918.56	III
15	2940.53	III
99000	2946.01	III
20 p	2948.48	III
6000	2970.42	III
1400	3013.93	III
1500	3018.85	III
3	3267.10	III
25 l	3276.80	III
500	3866.96	III
3000	3900.74	III
4000	3914.58	III
3800	4039.60	III
3000	4040.11	III

Y III

Intensity	Wavelength	
120 h	4121.61	III
2000 c	4737.62	III
7500	5102.88	III
1300	5120.40	III
10000	5238.10	III
3000	5263.58	III
4000	5383.64	III
6000	5562.81	III
600	5567.27	III
4000	5572.24	III
400	5595.48	III
3000	5602.08	III
2000 h	7254.58	III
9000	7558.71	III
6000	7864.53	III
8000	7916.71	III
400	7989.41	III
10000	7991.43	III
8000	8171.41	III
4000	8645.09	III
10000	8796.21	III
8000	9116.59	III

Y IV

Ref. 265 - J.R.

Vacuum

3	211.80	IV
3	214.51	IV
6	215.97	IV
6	217.39	IV
12	221.71	IV
3	222.18	IV
6	222.98	IV
2	228.84	IV
20	228.94	IV
3	229.78	IV
3	235.17	IV
25	235.77	IV
1	242.12	IV
30	242.30	IV
3	244.14	IV
3	263.72	IV
150	264.64	IV
30	272.40	IV
150	273.03	IV
10	278.60	IV
900	355.86	IV
300	370.42	IV
500	386.82	IV
600	425.03	IV
300	473.10	IV

Y V

Ref. 419 - J.R.

Vacuum

5	289.18	V
50	299.99	V
3	312.89	V
200	313.35	V
40	320.47	V
40	321.69	V
150	325.58	V
200	326.57	V
175	328.34	V
50	330.40	V
900	333.09	V
500	333.80	V
100	335.12	V
400	335.14	V
500	336.62	V

Y V

Intensity	Wavelength	
500	339.02	V
200	340.02	V
5	340.42	V
500	344.59	V
100	349.65	V
2	349.75	V
10	351.36	V
100	353.98	V
100	355.56	V
300	372.05	V
400	379.96	V
200	397.77	V
300	403.45	V
1	408.81	V
200	409.31	V
200	415.03	V
100	418.18	V
150	418.59	V
50	419.79	V
300	420.74	V
1	427.87	V
50	430.75	V
100	437.66	V
3	441.62	V
30	442.96	V
2	451.97	V
15	455.84	V
85	457.84	V
4000	584.98	V
2000	630.97	V

ZINC (Zn)

Z = 30

Zn I and II

Refs. 39,55,113,131,185,186 - R.D.C.

Vacuum

60	1193.23	II
60	1277.31	II
60 d	1366.68	II
	1404.12	I
60	1410.44	II
60	1439.09	II
60	1445.04	II
50	1456.91	II
	1457.57	I
60	1477.02	II
50	1514.76	II
90	1572.99	II
	1589.57	I
60	1617.68	II
60	1658.25	II
50	1713.25	II
60	1715.76	II
80 d	1735.61	II
60	1736.89	II
50	1737.90	II
75	1747.12	II
80 c	1762.19	II
75	1774.04	II
80	1790.76	II
100	1797.64	II
100 d	1811.05	II
80	1816.48	II
80	1831.38	II
100 d	1833.57	II
70	1836.01	II

Zn I and II		
Intensity	Wavelength	
75	1836.65	II
75	1847.56	II
100	1864.12	II
100	1866.08	II
100	1872.13	II
75	1894.26	II
60	1901.52	II
60	1914.81	II
100 d	1918.96	II
70	1920.27	II
100 d	1929.67	II
60	1945.58	II
60	1951.91	II
80	1953.00	II
75	1954.87	II
80	1964.54	II
100	1969.40	II
100	1982.11	II
70	1985.61	II
100	1986.99	II
50	1993.37	II
50	1996.92	II
	Air	
100	2011.94	II
500	2025.48	II
60	2039.31	II
500	2062.00	II
200	2064.23	II
120	2079.08	I
50	2079.93	II
60	2087.33	I
80	2096.93	I
300	2099.94	II
200	2102.18	II
150	2104.42	I
75	2122.74	II
800 r	2138.56	I
75	2147.42	II
60	2210.18	II
50	2273.15	II
1000	2501.99	II
150	2515.81	I
50	2527.96	II
1000	2557.95	II
50	2567.80	II
50	2567.98	II
100 h	2569.87	I
100	2582.44	I
300	2582.49	I
200	2608.56	I
300	2608.64	I
200	2670.53	I
300	2684.16	I
300	2712.49	I
200	2756.45	I
300	2770.86	I
300	2770.98	I
400	2800.87	I
100	2801.06	I
5	2801.17	I
100	2801.96	II
100	2902.30	II
125	3018.36	I
200	3035.78	I
200	3072.06	I
150	3075.90	I
100	3171.45	II
100	3172.23	II
300	3196.31	II

Zn I and II		
Intensity	Wavelength	
100	3197.10	II
500 r	3282.33	I
50	3299.42	II
800	3302.58	I
700 r	3302.94	I
75	3306.01	II
800	3345.02	I
500	3345.57	I
150	3345.94	I
5	3799.00	I
50	3806.34	II
100	3840.29	II
50	3883.34	I
15	3965.43	I
10	4113.21	I
25	4292.88	I
25	4298.33	I
35	4629.81	I
300	4680.14	I
400	4722.15	I
400	4810.53	I
800	4911.62	II
500	4924.03	II
7	5068.66	I
15	5069.58	I
200	5181.98	I
8	5308.65	I
7	5310.24	I
7	5311.02	I
4	5772.10	I
4	5775.50	I
10	5777.11	I
500	5894.33	II
500	6021.18	II
500	6102.49	II
100	6111.53	II
500	6214.61	II
8	6237.90	I
8	6239.17	I
1000 h	6362.34	I
10	6479.18	I
15	6928.32	I
8	6938.47	I
3	6943.20	I
200	7478.8	II
300	7588.5	II
100	7612.9	II
300	7732.5	II
200	7757.9	II
10	7799.36	I
100	11054.25	I
100	13053.63	I
100	13150.59	I
20	13196.61	I
100	14038.70	I
20	15680.29	I
20	16483.45	I
20	16491.98	I
20	16505.23	I
5	24044.16	I
10	24375.02	I

Zn III		
Refs. 376,377 - R.D.C.		
Vacuum		
1000	677.63	III
750	677.96	III
200	713.90	III
100	1432.15	III

Zn III		
Intensity	Wavelength	
200	1456.72	III
100	1464.20	III
100	1465.75	III
300	1473.41	III
100	1489.26	III
100	1490.96	III
200	1498.79	III
300	1499.42	III
300	1500.42	III
300	1505.92	III
300	1515.85	III
30	1533.09	III
300	1552.30	III
200	1552.94	III
80	1553.11	III
200	1560.79	III
150	1562.55	III
200	1581.53	III
100	1582.06	III
100	1598.52	III
100	1600.87	III
100	1619.61	III
150	1622.51	III
200	1629.19	III
200	1639.33	III
150	1644.82	III
100	1651.74	III
200	1673.05	III
100	1688.59	III
80	1695.40	III
80	1706.65	III
80	1749.63	III
50	1753.84	III
100	1767.69	III
80	1839.32	III

Zn IV		
Refs. 370,377 - R.D.C.		
Vacuum		
30	412.67	IV
30	423.42	IV
50	423.54	IV
200	425.90	IV
200	428.54	IV
80	428.79	IV
150	429.30	IV
200	430.59	IV
150	431.54	IV
120	431.62	IV
10	434.41	IV
150	435.02	IV
150	435.76	IV
80	436.25	IV
30	436.38	IV
50	436.82	IV
50	441.15	IV
20	441.52	IV
20	441.56	IV
100	441.70	IV
200	442.39	IV
150	444.39	IV
100	444.46	IV
100	446.58	IV
30	447.85	IV
10	449.13	IV
200	449.98	IV
200	450.99	IV
30	451.62	IV
20	452.80	IV

Zn IV		
Intensity	Wavelength	
80	456.67	IV
150	457.32	IV
200	466.93	IV
150	468.43	IV
200	472.09	IV
200	472.66	IV
200	473.02	IV
200	473.51	IV
200	474.56	IV
50	475.78	IV
200	476.42	IV
200	478.65	IV
200	478.90	IV
200	482.10	IV
10	482.68	IV
10	485.48	IV
10	489.19	IV
10	490.96	IV
10	493.37	IV
10	496.72	IV
100	497.70	IV
15	1193.29	IV
15	1203.44	IV
8	1212.71	IV
5	1214.14	IV
25	1224.35	IV
20	1227.62	IV
40	1228.65	IV
30	1231.46	IV
30	1237.26	IV
50	1239.12	IV
3	1246.26	IV
15	1247.01	IV
50	1249.69	IV
30	1253.67	IV
30	1257.31	IV
8	1259.68	IV
500	1265.74	IV
5	1269.15	IV
100	1272.21	IV
200	1272.98	IV
30	1275.78	IV
25	1278.51	IV
100	1280.47	IV
100	1291.83	IV
100	1292.49	IV
10	1294.32	IV
100	1296.62	IV
100	1296.73	IV
20	1301.88	IV
500	1306.66	IV
200	1318.00	IV
200	1320.74	IV
200	1321.22	IV
200	1322.33	IV
200	1322.43	IV
200	1326.74	IV
200	1329.11	IV
100	1333.32	IV
150	1344.08	IV
200	1347.98	IV
200	1349.90	IV
50	1352.27	IV
100	1356.20	IV
200	1357.82	IV
100	1363.43	IV
200	1363.95	IV
40	1368.17	IV
200	1369.53	IV

Zn IV		
Intensity	Wavelength	
50	1370.42	IV
100	1375.33	IV
50	1375.98	IV
200	1377.65	IV
50	1391.24	IV
80	1393.07	IV
50	1394.54	IV
30	1400.14	IV
15	1403.98	IV
30	1409.40	IV
5	1410.33	IV
30	1419.60	IV
50	1427.79	IV
20	1438.58	IV
80	1455.65	IV
200	1459.98	IV
100	1476.43	IV
100	1481.25	IV
100	1529.84	IV
50	1533.68	IV

ZIRCONIUM (Zr)

Z = 40

Zr I and II Ref. 1 -- C.H.C. Air		
60	2374.42	I
60	2384.17	I
50	2388.01	I
50	2389.21	I
45	2405.52	I
60	2419.41	II
150	2449.85	II
21	2457.44	II
75	2487.29	II
45	2496.48	II
180	2532.46	II
90	2539.65	I
220	2542.10	II
45	2550.51	I
220	2550.74	II
45	2556.43	I
60	2567.45	I
570	2567.64	II
1600	2568.87	II
2100	2571.39	II
75	2583.40	II
130	2589.07	II
22	2589.65	I
45	2609.43	I
150	2630.91	II
80	2635.42	I
210	2639.09	II
70	2643.40	II
55	2647.78	I
110	2650.38	II
70	2658.69	I
180	2667.80	II
55	2669.49	II
120	2670.96	II
1800	2678.63	II
35	2681.76	II
90	2687.75	I
90	2692.60	II
22	2692.92	I
160	2693.53	II
180	2694.06	II

Zr I and II		
Intensity	Wavelength	
70	2695.43	II
95	2699.60	II
750	2700.13	II
280	2711.51	II
140	2712.42	II
140	2714.26	II
1300	2722.61	II
140	2725.47	I
800	2726.49	II
490	2732.72	II
1400	2734.86	II
110	2740.51	II
140	2741.55	II
1100	2742.56	II
660	2745.86	II
660	2752.21	II
530	2758.81	II
200 d	2768.73	II
	2768.85	II
170 d	2774.04	I
	2774.16	II
200	2790.14	I
120	2792.04	I
160	2796.90	II
110	2799.15	II
180	2810.91	II
620	2814.90	I
390	2818.74	II
530	2825.56	II
110	2833.91	II
710	2837.23	I
120	2839.34	II
130	2843.52	II
660	2844.58	II
210	2848.19	II
350	2848.52	I
350	2851.97	II
340	2869.81	II
490	2875.98	I
120	2892.26	I
160	2905.23	II
300	2915.99	II
110	2916.64	II
270	2918.24	II
320	2926.99	II
160	2934.61	II
160	2936.31	II
320	2948.94	II
210	2951.48	II
320	2955.78	II
320	2960.87	I
320	2962.68	II
320	2968.96	II
120	2969.19	I
230	2969.63	II
130	2976.61	II
320	2978.05	II
230	2979.18	II
160	2981.02	II
820	2985.39	I
320	3003.74	II
100	3005.37	I
160	3005.50	I
820	3011.75	I
100	3013.32	II
160	3019.84	II
350	3020.47	II
500	3028.04	II
880	3029.52	I

Zr I and II		
Intensity	Wavelength	
180	3030.92	II
350 d	3036.39	II
100	3045.83	I
690	3054.84	II
100	3060.11	II
100	3064.63	II
110	3085.34	I
110	3094.80	I
250	3095.07	II
110	3095.82	I
280	3099.23	II
690	3106.58	II
110	3108.37	I
210	3110.88	II
350	3120.74	I
320	3125.92	II
500	3129.18	II
500	3129.76	II
140	3131.11	I
350	3132.07	I
110	3133.23	I
350	3133.48	II
180	3136.96	I
690	3138.68	II
140	3139.80	I
180	3148.82	I
290	3155.67	II
150	3157.00	II
320	3157.82	I
540	3164.31	II
150	3165.45	II
880	3165.97	II
150	3166.26	II
190	3178.09	II
190	3181.58	II
150	3181.92	II
880	3182.86	II
540	3191.21	I
210	3191.90	II
540	3212.01	I
760	3214.19	II
110	3222.47	II
200	3228.81	II
630	3231.69	II
630	3234.12	I
110	3236.58	II
760	3241.05	II
320	3250.39	I
200	3254.28	I
200	3260.11	I
190	3269.66	I
150	3271.13	II
540	3272.22	II
1000	3273.05	II
1300	3279.26	II
320 d	3282.73	I
880	3284.71	II
140	3285.88	II
150	3288.80	II
540	3305.15	II
880	3306.28	II
150	3313.70	II
210	3314.50	II
150	3319.02	II
380	3322.99	II
380	3326.80	II
380	3334.25	II
210	3334.62	II
190	3338.41	II

Zr I and II		
Intensity	Wavelength	
760	3340.56	II
380	3344.79	II
130	3353.66	I
180	3354.39	II
760	3356.09	II
540	3357.26	II
180	3359.96	II
150	3360.46	I
150	3363.82	II
150	3367.82	II
150	3370.59	I
180	3373.42	II
380	3374.73	II
110	3376.27	II
150	3377.46	II
570	3387.87	II
760	3388.30	II
5700	3391.98	II
570	3393.12	II
160	3396.33	II
380	3399.35	II
570	3404.83	II
760	3410.25	II
380	3414.66	I
1000	3430.53	II
380	3437.14	II
4700	3438.23	II
600	3447.36	I
200	3455.91	I
410	3457.56	II
200	3458.93	II
820	3463.02	II
600	3471.19	I
200	3478.79	I
1200	3479.39	II
1300	3481.15	II
760	3483.54	II
4100	3496.21	II
350	3505.48	II
820	3505.67	II
1000	3509.32	I
200	3510.46	II
2000	3519.60	I
440	3525.81	II
440	3533.22	I
210	3535.16	I
630	3542.62	II
1800	3547.68	I
210	3549.74	I
630	3550.46	I
1800	3551.95	II
2100	3556.60	II
1100	3566.10	I
210	3568.88	I
2100	3572.47	II
210	3573.08	II
1100	3575.79	I
1300	3576.85	II
880	3586.29	I
440	3587.98	II
3500	3601.19	I
690	3611.89	II
1100	3613.10	II
1100	3614.77	II
1100	3623.86	I
320	3634.15	I
260	3661.20	I
1100	3663.65	I
390	3671.27	II

Zr I and II			Zr I and II			Zr I and II			Zr I and II		
Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
800	3674.72	II	290	4156.24	II	280	4824.29	I	30	5486.09	I
390	3697.46	II	400	4161.21	II	190	4828.04	I	140	5502.12	I
960	3698.17	II	400	4166.36	I	110	4838.78	I	25	5507.87	I
720	3709.26	II	200	4183.32	I	210	4851.36	I	30	5517.11	I
270	3731.26	II	660	4187.56	I	160	4866.06	I	10	5518.05	I
560	3745.98	II	400	4194.76	I	110	4881.24	I	75	5528.41	I
880	3751.60	II	610	4199.09	I	110	4883.60	I	20	5532.30	I
480	3764.39	I	610	4201.46	I	100	4994.76	I	45	5537.46	I
480	3766.72	I	610	4208.98	II	30	5011.46	I	50	5545.32	I
340	3766.82	II	200	4211.88	II	250	5046.58	I	22bl	5551.75	ZrO
720	3780.54	I	400	4213.86	I	85	5060.39	I	25bl	5553.17	ZrO
560	3791.40	I	2000	4227.76	I	360	5064.91	I	12	5612.11	I
210	3817.58	II	200	4236.06	I	110	5065.22	I	120	5620.14	I
560	3822.41	I	2000	4239.31	I	100	5070.26	I	35	5623.53	I
2200	3835.96	I	770	4240.34	I	75	5073.98	I	25bl	5629.02	ZrO
1300	3836.76	II	770	4241.20	I	470	5078.25	I	25bl	5629.58	ZrO
550	3843.02	II	1200	4241.69	I	85	5085.26	I	160	5664.51	I
550	3847.01	I	310	4268.02	I	50	5112.27	II	20	5666.28	I
550	3849.25	I	550	4282.20	I	140	5115.24	I	120	5680.90	I
2900	3863.87	I	550	4294.79	I	50	5120.42	I	15	5685.42	I
770	3864.34	I	310	4302.89	I	85	5133.40	I	30	5708.89	I
990	3877.60	I	550	4341.13	I	300	5155.45	I	75bl	5718.21	ZrO
200	3879.05	I	1000	4347.89	I	200	5158.00	I	120	5735.70	I
1500	3885.42	I	290	4359.74	II	35	5158.67	I	35bl	5748.17	ZrO
2900	3890.32	I	310	4360.81	I	75	5160.99	I	17bl	5778.57	ZrO
2000	3891.38	I	350	4366.45	I	85	5165.96	I	160	5797.74	I
400	3900.52	I	240	4379.78	II	17	5178.99	I	30	5847.32	I
310	3915.94	II	190	4413.04	I	100	5183.70	I	50	5868.27	I
610	3921.79	I	240	4420.46	I	30	5187.03	I	110	5869.50	I
1200	3929.53	I	120	4427.24	I	100	5191.60	II	340	5879.80	I
200	3934.12	II	160	4431.49	I	100	5201.15	I	85	5885.62	I
200	3934.79	II	140	4443.00	II	85	5209.30	I	50	5901.09	I
940	3958.22	II	110	4457.43	I	85	5224.93	I	30bl	5908.61	ZrO
490	3966.66	I	110	4466.91	I	30	5243.47	I	140	5925.13	I
990	3968.26	I	110	4470.31	I	120	5277.41	I	100	5935.20	I
660	3973.50	I	190	4470.56	I	75	5280.05	I	110	5955.35	I
200	3975.29	I	200	4496.97	II	60	5294.82	I	30bl	5977.80	ZrO
200 h	3981.60	I	550	4507.12	I	120	5296.79	I	100	5984.23	I
770	3991.13	II	610	4535.75	I	60	5301.97	I	17	5995.37	I
770	3998.97	II	490	4542.22	I	110	5311.40	I	50	6001.05	I
200	4007.60	I	200	4553.01	I	25	5321.26	I	30	6025.36	I
200	4012.25	I	200	4555.13	I	22	5330.84	I	85	6032.61	I
400	4023.98	I	140	4555.52	I	12	5338.43	I	170	6045.85	I
770	4024.92	I	490	4575.52	I	30	5350.09	II	100	6049.24	I
990	4027.20	I	100	4582.29	I	30	5350.35	II	140	6062.84	I
240	4028.95	I	140	4590.55	I	25	5350.90	I	50	6120.83	I
400	4029.68	II	350	4602.57	I	25	5351.92	I	170	6121.91	I
490	4030.04	I	140	4604.42	I	75	5362.56	I	85	6124.84	I
400	4035.89	I	210	4626.41	I	12	5363.35	I	680	6127.44	I
240	4042.22	I	700	4633.98	I	17	5369.39	I	340	6134.55	I
610	4043.58	I	210	4644.83	I	20	5382.37	I	100	6140.46	I
490	4044.56	I	260	4683.42	I	270	5385.14	I	440	6143.20	I
400	4045.61	II	2300	4687.80	I	30	5386.65	I	30	6155.61	I
610	4048.67	II	510	4688.45	I	17	5391.18	I	75	6157.71	I
200	4050.33	II	110	4707.79	I	17	5395.88	I	25	6160.20	I
200	4050.48	I	1900	4710.08	I	25	5405.13	I	35	6189.40	I
770	4055.03	I	160	4711.92	I	85	5407.62	I	60	6192.96	I
600	4055.71	I	120	4717.62	I	17	5413.93	I	85	6213.05	I
330	4061.53	I	210	4719.12	I	20	5421.86	I	100	6214.69	I
1500	4064.16	I	300	4732.33	I	15	5426.36	I	170bl	6226.51	ZrO
2000	4072.70	I	1400	4739.48	I	25	5428.42	I	100	6257.26	I
310	4074.93	I	190	4762.78	I	25	5437.76	I	50 b	6261.05	ZrO
200	4076.53	I	870	4772.31	I	15	5440.41	I	35	6267.06	I
240	4078.31	I	210	4784.92	I	35	5448.57	I	45bl	6292.84	ZrO
2000	4081.22	I	160	4788.67	I	10	5474.92	I	120	6299.66	I
200	4108.40	I	260	4805.87	I	10	5477.40	I	15	6304.34	I
400	4121.46	I	140	4809.47	I	35	5478.33	I	300	6313.02	I
1200	4149.20	II	190	4815.04	I	35	5480.83	I	30	6314.71	I
200	4152.64	I	700	4815.63	I	10	5481.16	I	50	6321.35	I

Zr I and II		
Intensity	Wavelength	
22	6340.36	I
50bl	6345.10	ZrO
75	6345.22	I
75bl	6378.56	ZrO
35	6407.00	I
50 b	6412.39	ZrO
12	6426.17	I
35	6434.33	I
60	6445.74	I
20	6451.62	I
20	6457.63	I
110	6470.21	I
60bl	6473.79	ZrO
11	6484.35	I
110	6489.64	I
22	6493.10	I
50	6503.26	I
50	6506.36	I
50bl	6508.15	ZrO
30bl	6542.90	ZrO
35	6550.54	I
30	6569.43	I
20	6576.56	I
30 b	6578.06	ZrO
50	6591.99	I
10	6596.71	I
10	6598.84	I
50	6603.27	I
15	6620.56	I
11	6678.01	II
22	6688.18	I
11	6702.12	I
17	6709.61	I
27	6717.88	I
40	6752.73	I
75	6762.38	I
85	6769.16	I
27	6772.89	I
15	6787.15	II
35	6790.85	I
45	6828.78	I
45	6832.89	I
13	6845.33	I
17	6846.34	I
100	6846.97	I
27	6849.26	I
13	6852.56	I
120	6888.29	I
29	6900.59	I
20	6904.36	I
29	6907.37	I
20	6916.87	I
16	6932.38	I
29	6948.46	I
150	6953.84	I
60	6966.44	I
10	6975.91	I
150	6990.84	I
80	6994.32	I
10	7005.46	I
100	7027.40	I
25	7057.36	I
14	7057.96	I
140	7087.30	I
25	7089.43	I
35	7094.46	I
50	7095.59	I
540	7097.70	I
280	7102.91	I

Zr I and II		
Intensity	Wavelength	
170	7103.72	I
140	7111.68	I
40	7112.82	I
18	7113.52	I
12	7132.95	I
16	7140.74	I
12	7144.47	I
590	7169.09	I
50	7201.62	I
12	7258.17	I
35	7264.76	I
20	7306.21	I
25	7311.62	I
35	7313.72	I
90	7318.08	I
10	7327.82	I
50	7335.97	I
50	7343.96	I
20	7373.50	I
25	7383.63	I
14	7400.90	I
10	7411.39	I
10	7422.75	I
10	7433.10	I
110	7439.86	I
18	7467.57	I
16	7479.58	I
14 h	7515.70	I
12	7517.95	I
20 h	7540.62	I
20	7544.59	I
29	7551.46	I
40	7554.70	I
25	7558.45	I
12	7560.09	I
12	7562.12	I
80	7607.15	I
14	7612.08	I
20	7621.17	I
29	7658.60	I
18	7690.83	I
14	7704.27	I
10	7708.42	I
10	7766.55	I
12	7816.32	I
110	7819.35	I
35	7822.94	I
40	7826.72	I
90	7849.35	I
35	7869.99	I
14	7876.25	I
16	7882.18	I
10	7897.98	I
16	7908.46	I
20	7940.47	I
160	7944.61	I
80	7956.66	I
80	7959.98	I
20	7963.63	I
160	8005.27	I
25	8046.05	I
16	8053.06	I
20	8055.29	I
20	8055.76	I
60	8058.08	I
150	8063.09	I
790	8070.08	I
10	8114.28	I
20	8120.17	I

Zr I and II		
Intensity	Wavelength	
390	8132.99	I
20	8152.58	I
12	8188.77	I
40	8194.73	I
60	8201.73	I
280	8212.53	I
20	8240.37	I
40	8283.81	I
140	8305.90	I
14	8332.44	I
50	8370.23	I
120	8389.41	I
70	8414.00	I
50	8453.17	I
50	8464.65	I
40	8498.44	I
18	8584.21	I
10	8734.86	I
12	8749.48	I
10	8786.23	I
16	8804.98	I
70	8836.09	I
60	8899.52	I
Zr III		
Ref. 403 – J.R.		
Vacuum		
25	687.64	III
50	690.39	III
25	819.59	III
30	820.21	III
35	823.69	III
25	829.50	III
30	850.61	III
25	859.56	III
30	864.86	III
25	868.64	III
25	868.99	III
25	919.59	III
30	1320.81	III
25	1375.13	III
30	1378.93	III
40	1403.48	III
35	1420.12	III
25	1420.87	III
25	1465.44	III
25	1563.24	III
40	1593.59	III
100	1612.38	III
50	1620.62	III
75	1631.31	III
50	1638.33	III
35	1675.06	III
35	1675.75	III
40	1703.36	III
40	1725.03	III
40	1754.38	III
35	1759.12	III
30	1764.75	III
30	1771.96	III
40	1773.90	III
100	1779.51	III
40	1783.35	III
200	1790.19	III
150	1793.56	III
125	1798.13	III
75	1800.03	III
25	1801.67	III
100	1805.26	III

Zr III		
Intensity	Wavelength	
35	1831.89	III
40	1850.06	III
40	1853.38	III
30	1859.12	III
25	1860.47	III
25	1861.77	III
75	1864.06	III
30	1865.45	III
35	1877.00	III
50	1892.07	III
65	1914.25	III
75	1921.96	III
75	1932.54	III
50	1934.32	III
40	1935.20	III
75	1936.48	III
75	1936.67	III
80	1937.27	III
200	1940.25	III
100	1941.08	III
25	1946.12	III
80	1946.61	III
50	1946.99	III
100	1953.95	III
50	1961.32	III
100	1962.01	III
40	1962.92	III
85	1966.22	III
25	1967.81	III
60	1974.99	III
40	1983.14	III
50	1989.83	III
30	1990.95	III
30	1994.46	III
Air		
45	2000.23	III
100	2006.82	III
30	2013.30	III
35	2016.63	III
30	2021.52	III
60	2026.78	III
100	2035.42	III
50	2036.92	III
75	2056.13	III
40	2058.73	III
75	2060.83	III
50	2061.47	III
125	2070.43	III
50	2074.12	III
100	2077.92	III
100	2080.99	III
30	2081.81	III
25	2085.35	III
200	2086.78	III
40	2089.50	III
40	2097.03	III
40	2102.30	III
50	2103.16	III
25	2104.23	III
40	2113.98	III
35	2114.10	III
40	2125.06	III
35	2137.90	III
35	2138.45	III
25	2139.85	III
40	2159.24	III
40	2162.20	III
100	2175.80	III
100	2191.15	III

Zr III		
Intensity	Wavelength	
35	2192.05	III
60	2206.33	III
40	2206.97	III
30	2231.00	III
50	2245.36	III
25	2251.14	III
40	2257.83	III
30	2281.43	III
100	2301.60	III
75	2308.12	III
35	2405.81	III
40	2406.21	III
75	2420.65	III
25	2438.70	III
50	2444.58	III
100	2448.86	III
100	2593.64	III
250	2620.56	III
50	2621.28	III
60	2628.26	III
200	2643.79	III
100	2656.46	III
150	2664.26	III
100	2682.16	III
75	2686.28	III
70	2690.49	III
60	2698.31	III
50	2709.05	III
45	2715.76	III
40	2720.07	III
75	2735.76	III
25	2775.23	III
40	2836.18	III
40	3278.86	III

Zr IV		
Refs. 362,403 - J.R.		
Vacuum		
15	478.97	IV
60	480.66	IV
60	497.23	IV
60	500.22	IV
4	500.34	IV
4	584.65	IV
15	585.42	IV
2	586.42	IV
60	588.89	IV
100	589.74	IV
600	628.66	IV
500	633.56	IV
200	633.63	IV
8	712.49	IV
90	754.39	IV
90	760.15	IV
150	846.40	IV
300	863.65	IV
500	864.59	IV
200	881.30	IV
200	882.59	IV
100	1099.76	IV
150	1100.00	IV
9000	1183.97	IV
9000	1201.77	IV
200	1212.71	IV
100	1213.01	IV
10000	1219.86	IV
500	1285.89	IV
500	1290.56	IV
70	1291.70	IV

Zr IV		
Intensity	Wavelength	
500	1417.70	IV
500	1440.65	IV
500	1441.06	IV
1000	1469.47	IV
10000	1546.17	IV
10	1596.29	IV
10000	1598.95	IV
150	1605.26	IV
5000	1607.95	IV
90	1609.50	IV
35	1818.06	IV
500	1836.15	IV
500	1846.37	IV
200	1848.03	IV
70	1851.91	IV
Air		
20	2045.12	IV
40	2047.15	IV
10000	2091.49	IV
10000	2092.36	IV
10000	2163.68	IV
10000	2286.67	IV
200	2473.75	IV
300	2476.71	IV
5	2572.32	IV
400	2573.66	IV
400	2583.32	IV

Zr V		
Ref. 418 - J.R.		
Vacuum		
300	292.19	V
500	304.01	V
300	305.24	V
400 p	368.18	V
200	519.25	V
200	536.50	V
200 p	674.13	V
200	675.53	V
300	679.39	V
200	688.27	V
200 p	703.03	V
300	717.24	V
200	740.33	V
2000	740.61	V
500	742.74	V
300	752.48	V
300	764.58	V
500	766.20	V
200	773.80	V
200	775.58	V
200	779.21	V
400	784.50	V
400	797.23	V
10000	800.00	V
10000	806.89	V
200	809.75	V
10000	812.05	V
500	822.06	V
300 p	823.46	V
200	823.78	V
200	825.13	V
200	830.59	V
400	836.57	V
3000	841.40	V
300 p	852.87	V
700	853.68	V
200	873.11	V
300	885.68	V

Zr V		
Intensity	Wavelength	
300	900.48	V
500	906.66	V
500	915.30	V
400	923.10	V
400	940.41	V
200	949.70	V
200	978.06	V
200	980.70	V
200	984.18	V
300	995.59	V
400	1002.48	V
400	1038.69	V
200	1044.41	V
300	1047.77	V
400	1068.55	V
300	1072.25	V
300	1083.45	V
200	1087.05	V
200	1093.54	V
200	1108.79	V
300	1194.24	V
300	1200.76	V
200	1233.91	V
300	1238.93	V
300	1253.61	V
200	1259.70	V
400	1260.91	V
500	1265.38	V
300	1295.81	V
400	1302.80	V
500	1303.93	V
400	1306.76	V
200	1315.14	V
400	1320.74	V
500 p	1323.81	V
300	1332.06	V
300	1337.34	V
300	1355.21	V
500	1355.98	V
300	1361.39	V
500	1376.54	V
200	1396.79	V
300	1410.03	V
200	1413.40	V
300	1460.05	V
300	1486.90	V
300	1491.33	V
200	1520.47	V
200	1550.12	V
500	1633.03	V
500	1654.46	V
700	1725.02	V
500	1786.20	V
200 p	1790.81	V
500	1806.09	V
500	1860.48	V
600	1860.86	V
500	1878.33	V
400	1926.24	V
500	1927.43	V
400	1934.88	V
Air		
500	2009.29	V
600	2028.54	V
600	2132.42	V
200	2150.18	V
200	2336.94	V

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Section 2. Arranged by Wavelength

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
110	34.973	C V	250	104.07	Al V	200	131.41	Na V	40	162.27	F V
450	40.268	C V		104.1	Li III	900	131.44	Al V	12	162.448	Na IV
	41.00	B V	250	104.18	Al V	300 h	131.64	Na V	10	163.190	Na IV
30	48.59	B V		104.40	Be II	45	131.99	Ne V	40	163.50	F V
10	52.68	B IV		104.67	Be I	50	132.04	Ne V	50	163.56	F V
	58.13	Be IV		105.5	Li III	500	132.63	Al V	300	163.62	Na V
	58.57	Be IV		105.80	Be I	300	132.81	Mg IV	100	164.02	Ne V
	59.32	Be IV	100	106.28	Na V	500	133.16	Na V	100	164.14	Ne V
30	60.31	B IV		106.30	Mg III	400	133.39	Na V	80	164.574	O V
	60.74	Be IV	100	106.30	Na V	200	134.27	Na V	110	164.657	O V
	64.06	Be IV	100	106.40	Na V	40	134.54	F V	80	164.709	O V
	75.93	Be IV	100	106.49	Na V		135.0	Li III	90	165.98	F V
1 h	76.10	Be III		106.92	Mg III	110	135.523	O V	100	166.18	F V
2	76.48	Be III		107.26	Be I	300	135.79	Na V	80	166.235	O V
3	78.53	Be III		107.38	Be I	300	135.85	Na V	52	166.947	N V
1	78.61	Si V	200 c	107.93	Na V		136.5	Li II		167.21	Li II
4	78.66	Be III	600	107.95	Al V	4	136.551	Na IV	150	167.99	O V
1	78.90	Si V		108.0	Li III	4	136.854	Na IV	12	168.411	Na IV
1 h	78.92	Be III	200	108.02	Na V	80	138.109	O V	10	168.546	Na IV
2	80.81	Si V	300	108.06	Al V	200	138.81	Na V		168.74	Li II
2	81.11	Si V		108.08	Mg III	300	138.92	Na V	30	169.79	F IV
5	81.89	Be III	300	108.11	Al V	110	139.029	O V	30	169.84	F IV
10	82.38	Be III		110.16	Mg III	4	139.961	Na IV	110	170.219	O V
	82.58	Be II	200 c	110.82	Na V		140.5	Li II	15	170.80	Mg III
20	83.20	Be III	200	110.88	Na V	150	140.76	Ne V	30	171.07	F IV
	83.66	Be II	100	111.51	Na V	150	140.79	Ne V	15	171.39	Mg III
30	84.76	Be III	300 c	112.01	Na V	7	142.232	Na IV		171.58	Li II
10	85.18	Si V		113.9	Li III	6	142.359	Na IV	450	172.169	O V
6	85.58	Si V		114.32	Mg III	100	142.44	Ne V	80	172.62	Ne IV
50	88.31	Be III	100 h	114.70	Na V	100	142.50	Ne V	500	173.93	Ne V
	89.16	Be I	100	114.74	Na V	150	142.72	Ne V	40	174.70	F V
	89.80	Be II	20	117.86	Si V	100	143.27	Ne V	40	176.37	F IV
	90.04	Be II	400	117.99	Na V	150	143.34	Ne V	80	177.16	Ne IV
	90.21	Be I	40	118.16	Mg IV	8	146.064	Na IV		178.02	Li II
4	90.45	Si V	250	118.50	Al V	7	146.302	Na IV	50	178.43	F V
	90.67	Be I	80 p	118.81	Mg IV	400	146.95	Mg IV	40	178.59	F V
4	90.85	Si V	20	118.97	Si V	150	147.13	Ne V	150	179.42	Sc V
	91.06	Be II	66	119.01	Ne V	300	147.41	Mg IV	350	180.07	Mg IV
	91.36	Be II	100	120.04	Na V	300	147.54	Mg IV	350	180.14	Sc V
	91.74	Be II	200	122.52	Ne V	40	147.95	F V	400	180.62	Mg IV
	92.19	Be I	70	123.59	Mg IV	50	148.00	F V	400	180.80	Mg IV
	92.61	Be II	400	124.03	Al IV	400	148.64	Na V	200	180.82	Sc V
	93.14	Be II	80	124.616	O V	300	148.86	Na V	200	180.96	Sc V
	93.42	Be II	240	124.65	Mg IV	9	150.298	Na IV	350	181.34	Mg IV
	93.93	Be II	66	125.12	Ne V	7	150.543	Na IV	40	181.52	F IV
	94.78	Be II	400	125.18	Na V	7 c	150.64	Na IV	50	181.55	Sc V
	95.76	Be II	400	125.22	Na V	8	150.687	Na IV	40	181.57	F IV
	96.29	Be I	500	125.29	Na V	400	151.13	Na V	400	181.75	N IV
15	96.44	Si V	300	125.43	Na V	66	151.23	Ne V	15	182.24	Mg III
10	97.14	Si V	300	125.46	Na V	7	151.299	Na IV	200	182.39	Sc V
	97.24	Be I		125.5	Li II	120	151.42	Ne V	12	182.97	Mg III
	97.44	Be I	900	125.53	Al V	80	151.447	O V	40	182.98	F V
	97.86	Be I	200	125.90	Na V	110	151.477	O V	5	183.95	Na III
	97.97	Be I	800	126.07	Al V	150	151.546	O V		184.05	Mg II
	98.12	Be I	100	126.21	Na V	15	151.82	Ne IV		184.31	Mg II
2	98.21	Si V		126.50	Mg III	15	152.23	Ne IV		184.68	Mg II
	98.37	Be I	200	126.56	Na V	40	152.51	F V		184.81	Mg II
	98.66	Be I	100	126.61	Na V	45	154.50	Ne V		185.26	Mg II
	98.94	Be I	400	127.44	Na V	7	155.083	Na IV		185.59	Mg II
	99.19	Be I	400	127.47	Na V	7	155.240	Na IV	250	185.745	O V
100	100.25	Be III	400	128.03	Na V	7	155.448	Na IV		185.98	Mg II
	100.86	Be I	400	128.05	Na V	8	155.510	Na IV	52	186.069	N V
	101.20	Be I	700	129.73	Al IV	8	156.537	Na IV	62	186.153	N V
	102.13	Be I	300	129.86	Mg IV	300	157.21	Na V		186.47	Mg II
	102.49	Be II	800	130.41	Al V	40	158.54	F V	20	186.51	Mg III
	102.9	Li III	200	130.68	Na V	15	158.65	Ne IV	150	186.58	Ne IV
	103.4	Li III	1000	130.85	Al V	15	158.82	Ne IV	40	186.72	F V
300	103.80	Al V	900	131.00	Al V	800	160.07	Al IV	40	186.79	F V
400	103.88	Al V	300	131.35	Na V	700	161.69	Al IV	50	186.84	F V

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
	186.84	Mg II	60	201.22	F IV		216.68	Mg I	140	234.32	Ne IV
40	186.97	F V		202.00	Mg II	500	217.20	N IV	30	234.347	He II
40	187.01	F V	6	202.15	Na III		217.21	Mg I	120	234.70	Ne IV
	187.19	Mg II	80	202.161	O V		217.37	Mg I	3	235.17	Y IV
20	187.20	Mg III	6	202.19	Na III	6	217 39	Y IV	25	235.77	Y IV
30	187.24	F IV	80	202.224	O V	500 d	217.90	N IV	550	236.07	N IV
	187.38	Mg II		202.27	Mg II		218.19	Mg I	50	237.331	He II
10	188.53	Mg III	80	202.283	O V		218.34	Mg I	500	237.99	N IV
	188.54	Mg II	80	202.334	O V		218.42	Mg I	90	238.36	O IV
	188.91	Mg II	150	202.393	O V		218.74	Mg I	180	238.57	O IV
	189.01	Mg II	8	202.49	Na III		219.04	Mg I	500 w	238.7	N IV
	189.23	Mg II		202.51	Mg II		219.28	Mg I	600	238.80	N IV
5 h	189.35	Na III	500	202.60	N IV		220.03	Mg I	16	239.41	V V
	189.37	Mg II	5 d	202.71	Na III	8	220.28	Sc IV	19	239.48	V V
200	190.36	Ca V	7 d	202.72	Na III		220.33	Mg I	500 w	239.62	N IV
10	190.445	Na IV	8	202.76	Na III	520	220.352	O V	70	239.86	F IV
250	190.46	Ca V		202.94	Mg II	70	220.77	F IV	70	240.02	F IV
60	190.57	F V	8 p	203.06	Na III	12	221.71	Y IV	90	240.08	F IV
70	190.84	F V		203.15	Mg I		222.03	Mg I	70	240.15	F IV
	191.30	Mg II	8	203.28	Na III	3	222.18	Y IV	70	240.28	F IV
	191.56	Mg II	8	203.33	Na III		222.67	Mg I	70	240.37	F IV
	191.65	Mg II		203.42	Mg II	6	222.98	Y IV	1	242.12	Y IV
400	191.7	N IV		203.53	Mg II	140	223.24	Ne IV	30	242.30	Y IV
40	191.97	F V	110	203.78	O V	500 d	223.4	N IV	100	243.027	He II
	192.40	Mg II	150	203.82	O V		223.45	Mg I	40	243.82	Sc V
	192.55	Mg II	100	203.85	O V	120	223.60	Ne IV	500	243.87	Sc V
375	192.751	O V	200	203.89	O V		223.74	Mg I	3	244.14	Y IV
450	192.799	O V	100	203.94	O V	18	224.91	V V	250	244.91	C IV
	192.84	Mg II		204.22	Mg I	800 w	225.12	N IV	400	246.42	Sc V
400	192.9	N IV	10 c	205.49	Na IV		225.18	Mg I		247.14	Mg II
520	192.906	O V	40	205.55	F V	800	225.21	N IV	900	247.20	N IV
80	193.003	O V	500	205.94	N IV	12	225.35	Ti V	90	247.561	N V
	193.09	Mg II	500	205.97	N IV	20	225.46	V V	120	247.706	N V
	193.31	Mg II	500	206.03	N IV		225.54	Mg I	500 w	248.43	N IV
	193.40	Mg II	110	207.18	O IV		226.26	Mg I	110	248.459	O V
	193.64	Mg II	150	207.24	O IV	60	226.94	F IV	500 w	248.46	N IV
5	193.80	Na III	10	207.30	Na III	50	227.10	F IV		248.47	Mg II
5 h	194.04	Na III		207.5	Li II	110	227.19	C V	500 w	248.48	N IV
5 h	194.17	Na III	300	207.794	O V	80	227.372	O V	160	248.66	C V
100	194.28	Ne IV	90	208.25	F IV	80	227.469	O V	160	248.74	C V
5	194.29	Na III	100	208.48	Ne IV	150	227.511	O V	150	249.41	Ca IV
	194.37	B V	100	208.73	Ne IV	80	227.549	O V	150	250.15	Ca IV
200	194.593	O V	80	208.90	Ne IV	80	227.634	O V	50 c	250.52	Na III
6	194.68	Na III		209.09	Mg II	80	227.689	O V	400	250.98	Sc V
6	195.53	Na III	90	209.303	N V	17	227.88	V V	100	251.03	F IV
150	195.86	O IV		209.43	Mg II	300	228.56	Sc V	20	251.14	Ne III
200	196.01	O IV		209.84	Mg I	2	228.84	Y IV	150	251.35	Ca IV
50	196.39	F IV	3	211.80	Y IV	10	228.91	Ti V	30	251.37	Na III
60	196.45	F IV	150	212.56	Ne IV	20	228.94	Y IV	20	251.56	Ne III
500	196.87	N IV		213.53	Mg I	3	229.78	Y IV	5	251.58	Mg V
250	196.97	Ca V	70	213.85	F IV	15	229.87	Na III	20	251.66	V V
500	197.23	N IV	70	214.06	F IV	50 h	230.12	F III	20	251.73	Ne III
	197.76	Mg II	100	214.35	K V	12	230.59	Na III	18	252.44	V V
	199.28	Li II	3	214.51	Y IV	100	230.85	Sc V	110	252.56	O IV
	199.31	Mg II	150	215.040	O V	15	231.454	He II	500	252.85	Sc V
300	199.55	Ca V	200	215.103	O V	100	231.73	Mg III	110	252.95	O IV
50	199.76	F IV		215.12	Mg I	150	231.823	O V	17	252.96	Ti V
10	199.772	Na IV	250	215.245	O V	20	232.584	He II	150	253.08	O IV
50	199.80	F IV		215.31	Mg I	60	233.22	F IV	500	253.73	Sc V
50	199.85	F IV	10 c	215.34	Na III	50	233.39	F IV	50	255.38	Sc V
50	199.93	F IV		215.45	Mg I	140	233.46	O IV	80	255.59	P V
50	200.00	F IV		215.66	Mg I	150	233.50	O IV	300	255.64	Sc V
70	200.09	F IV		215.79	Mg I	110	233.52	O IV	50	255.67	P V
	200.29	Mg I	12	215.86	Na III	200	233.56	O IV	50	255.72	F III
250	200.51	Ca V	6	215.97	Y IV	110	233.60	O IV	60	255.77	F III
60	201.01	F IV	250	216.018	O V	600 w	234.12	N IV	70	255.86	F III
70	201.06	F IV	12	216.12	Na III	600 w	234.20	N IV	300	256.317	He II
60	201.10	F IV		216.22	Mg I	600 w	234.25	N IV	200	257.16	Sc V
80	201.16	F IV		216.36	Mg I	80	234.26	Mg III	500	257.95	N III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
265	257.98	Ca V	350	283.58	N IV	90	301.32	Na II	300	319.62	Cl IV
150	258.24	Sc V	110	283.69	Ne III	100	301.44	Na II	10	319.644	Na IV
650	258.50	N III	40	283.89	Ne III	12	301.67	Sr IV	10	320.293	He I
40	258.81	Sc V	900	283.91	Sc V	60	302.45	Na II	40	320.47	Y V
9 h	258.95	Cu V	49	283.97	Cu V	30	302.86	Ga V	12	320.53	Ga V
700	259.19	N III	12	284.31	Sr IV	90	303.123	N IV	450	320.979	O III
50	260.05	Sc V	800	284.45	Sc V	500	303.28	N IV	4000	320.99	Mg IV
800	260.09	N III	300	284.98	Ca V	150	303.41	O III	66	321.05	Cu V
300	260.39	O IV	600	285.56	N IV	150	303.46	O III	120	321.59	Ca IV
165	260.45	Ca V	110	285.71	O IV	140	303.52	O III	50	321.61	Sr III
600	260.45	N IV	150	285.84	O IV	160	303.62	O III	40	321.69	Y V
250	260.56	O IV	18	285.98	V V	160	303.69	O III	500	322.17	Ca V
5	261.20	K II	110	286.448	O V	1000	303.780	He II	40	322.31	Ga V
800	261.28	N III	20	286.84	V V	500	303.786	He II	120	322.503	N IV
70	261.71	F III	450 c	286.96	Ca V	250	303.80	O III	150	322.570	N IV
60	261.75	F III	300	287.33	Cl V	20	303.84	Ga V	200	322.724	N IV
	262.37	B V	600	288.29	Sc V	500	304.01	Zr V	250	322.76	Ca V
500	262.91	N III	200	289.14	C IV	29	304.02	Ni V	50	322.99	Ga V
3	263.72	Y IV	5	289.18	Y V	200	304.98	Ge V	30	323.10	Ga V
80	263.81	F III	250	289.23	C IV	41	304.99	Ga IV	120	323.175	N IV
80 d	264.34	O III	900	289.59	Sc V	90	304.996	P IV	300	323.22	Ca V
110	264.48	O III	15	289.85	Sc IV	300	305.24	Zr V	600	323.26	N III
150	264.64	Y IV	5	290.53	Ga V	200	305.60	O III	3000	323.31	Mg IV
500	265.23	N III	12	291.09	Sr IV	250	305.66	O III	7	323.36	Ti V
500	265.27	N III	12	291.19	Sr IV	190	305.70	O III	40	324.25	Ga V
150	266.196	N V	1000 d	291.93	Sc V	300	305.77	O III	250	324.48	Ca V
200	266.379	N V	300	292.19	Zr V	65	305.83	Cu V	40	324.95	Ga V
25	266.90	Na III	12	293.22	Sr IV	190	305.84	O III	250	325.28	Ca V
110	266.97	O III	800	293.25	Sc V	200	306.62	O IV	2	325.28	K III
150	266.98	O III	150	293.33	K V	150	306.88	O IV	150	325.58	Y V
150	267.03	O III	22	293.41	Cu V	30	307.03	Ga V	40	326.14	Ga V
40	267.06	Ne III	700	294.51	Ge V	800	307.15	Na V	74	326.57	Cu V
40	267.52	Ne III	14	294.53	Ga IV	25	307.18	Sr III	200	326.57	Y V
70	267.65	Na III	300	294.84	K V	30	308.26	Ga V	30	326.77	Ga V
20	267.71	Ne III	80	295.62	O III	1000	308.26	Na V	250	327.38	K V
400	267.77	Ca V	1000	295.64	Ge V	15	309.64	Ga V	5	327.60	K III
50	267.87	Na III	110	295.66	O III	110	310.58	P V	175	328.34	Y V
50	268.63	Na III	61	295.67	Ga IV	200	311.24	K V	300	328.45	O III
500	268.70	N III	120	295.72	O III	150	311.34	P V	300	328.47	P V
60	270.23	F IV	1	296.13	Ga V	30	311.79	Ga V	30	328.65	Ga V
300	270.31	Ca V	200	296.17	K V	10	312.30	Mg V	250	328.74	O III
650	270.99	N IV	400	296.17	Sc V	17	312.39	V V	250	328.78	P V
200	271.14	Ca V	15	296.31	Sc IV	25	312.41	Ga V	250	329.12	Ca IV
49	271.33	Cu V	250	296.55	Ca IV	570	312.42	C IV	150	329.39	Ca IV
150	271.82	K IV	5	296.82	Ga V	500	312.46	C IV	50	330.40	Y V
20 p	272.08	Na III	6	296.96	Ca III	51	312.51	Cu V	125	330.67	Sr III
250	272.27	Ca V	200	297.06	K V	250	312.77	K V	25	330.68	K III
30	272.40	Y IV	600 w	297.7	N IV	3	312.89	Y V	300	330.94	Ca V
20	272.45	Na III	700	297.82	N IV	220	313.05	Ne III	200	331.44	Ca IV
200	272.98	Ca V	15	298.12	Sr IV	200	313.35	Y V	200	331.84	Cl IV
150	273.03	Y IV	30	298.44	Ga V	30	313.68	Ga V	250	331.99	Ca IV
100	273.06	K IV	15	299.04	Sc IV	220	313.68	Ne III	235	332.53	Ca IV
35	276.58	Mg V	200	299.32	Ca IV	40	313.95	Ne III	800	332.55	Na V
150	277.38	O III	20	299.47	Ga V	150	314.715	N III	150	332.81	Ca IV
10	278.60	Y IV	56	299.64	Cu V	200	314.850	N III	900	333.09	Y V
1000	278.69	Al V	50	299.99	Y V	90	314.877	N III	200	333.44	Ca V
300	279.63	O IV	700	300.00	Sc V	150	315.053	N IV	82	333.56	Cu V
70	279.69	F III	30	300.01	Ga V	200	315.18	K V	200	333.57	Ca V
	279.88	K IV	15	300.12	Sr IV	80	315.22	F III	500	333.80	Y V
375	279.94	O IV	160	300.15	Na II	55	315.24	Ni V	900	333.91	Na V
400	280.99	Ca V	160	300.20	Na II	70	315.54	F III	300	334.55	Ca V
400	281.00	Sc V	200	300.25	K V	56	315.71	Ni V	300	335.050	N IV
900	281.39	Al V	12	300.27	Sr IV	60	315.75	F III	100	335.12	Y V
90	282.301	P IV	650	300.32	N IV	15	315.95	Ga V	400	335.14	Y V
150	282.35	K V	200	300.50	K V	50	316.11	Sr III	250 c	335.34	Ca V
40	283.18	Ne III	25	300.57	Ga V	20	316.48	Ga V	200	336.55	Ca V
160	283.21	Ne III	10	300.78	Ga V	200	318.09	Ca IV	3	336.56	Ar V
250	283.42	N IV	220	301.12	Ne III	50	318.39	Ca IV	5	336.61	Ga V
300	283.48	N IV	20	301.19	Ga V	40	319.41	Ga V	500	336.62	Y V

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
63	336.79	Ni V	90	355.33	O III	250	371.75	C III	11	382.76	In V
200	337.54	Ca V	86	355.41	Cu V	68	371.76	Ni V	300	382.91	K IV
3	337.56	Ar V	80	355.47	O III	150	371.78	C III	10	383.05	In V
6	338.00	Ar V	20	355.52	Co V	200	372.001	P IV	650	384.03	C IV
250	338.06	Ca V	100	355.56	Y V	300	372.05	Y V	250	384.10	K IV
500	338.35	N III	68	355.61	Ni V	300	372.08	Na II	700	384.18	C IV
2	338.43	Ar V	1	355.77	Bi V	500	372.15	K V	300	384.96	Fe V
200	338.83	Ca IV	70	355.78	Ni V	200	372.46	K V	300	384.97	Fe V
2	339.01	Ar V	900	355.86	Y IV	2	372.53	Pb V	450	385.0	B IV
500	339.02	Y V	18	355.88	Co V	100	372.55	Sn V	300	385.03	Fe V
150	339.79	Ca IV	12	356.06	Co V	200	372.77	K V	300	385.11	Fe V
81	339.88	Cu V	250	356.25	Ca V	10	372.82	In V	300	385.25	Fe V
3	339.89	Ar V	150	356.26	K IV	10	372.94	In V	300	385.26	Fe V
200	340.02	Y V	65	357.37	Ni V	67	373.60	Ni V	300	385.30	Fe V
500	340.20	N III	50	357.83	Ne IV	300	373.78	Cl V	300	385.75	Fe V
200	340.29	Ca IV	400	357.96	Ne V	210	373.80	O III	300	385.88	Fe V
5	340.42	Y V	500	358.47	Ne V	200	374.00	O III	350	386.16	Fe V
300	340.46	K IV	69	358.57	Ni V	300	374.08	O III	500	386.203	C III
150	340.74	K IV	68	358.58	Ni V	190	374.16	O III	17	386.21	In V
200	341.29	Ca IV	200	358.72	Ne IV	300	374.204	N III	200	386.61	K IV
200	341.46	Ca IV	75	358.80	Sr III	300	374.24	Fe V	10	386.70	In V
30	341.92	K III	200	359.02	O III	200	374.33	O III	300	386.74	Fe V
250 c	342.45	Ca IV	190	359.22	O III	20	374.40	Cu IV	300	386.78	Fe V
100	343.19	Ca IV	120	359.293	P IV	210	374.44	O III	500	386.82	Y IV
200	343.44	Ca IV	500	359.38	Ne V	350	374.441	N III	300	386.85	Fe V
200	343.64	Ca V	150	359.38	O III	250	374.74	Ca IV	300	386.88	Fe V
250	343.93	Ca IV	66	359.47	Ni V	300	374.87	Fe V	350	386.88	Fe V
68	343.93	Ni V	300	359.73	K IV	2	374.95	In V	200	387.08	Ca V
160	344.0	B IV	150	359.899	P IV	400	375.05	Sc V	125	387.14	Ne IV
100	344.12	La IV	200	359.91	K IV	30	375.30	F II	400	387.20	Fe V
500	344.59	Y V	800	360.32	Na V	6	375.84	In V	70	387.40	Cu V
200	344.96	Ca IV	800	360.37	Na V	300	375.96	K IV	500	387.48	N III
215	345.13	Ca IV	10	360.76	Na IV	300	375.96	K V	400	387.50	Fe V
300	345.31	O III	30	360.86	Cu IV	300	375.98	Fe V	300	387.62	Fe V
81	346.00	Cu V	150	361.01	Sn V	6	376.07	In V	400	387.76	Fe V
150	347.23	P V	300	361.28	Fe V	350	376.38	Na II	400	387.78	Fe V
78	347.34	Ni V	90	361.433	Ne II	10	376.79	In V	300	387.80	K V
70	347.46	Ni V	120	361.514	P IV	250	377.18	Ca V	2	387.87	Pb V
67	347.72	Ni V	150	361.629	P IV	72	377.68	Ni V	300	387.98	Fe V
15	348.00	K III	250	362.08	K IV	74	377.76	Cu V	100	388.22	Ne IV
71	348.10	Ni V	150	362.15	K IV	250	377.76	K V	500	388.318	P IV
200	348.20	P V	60	362.455	Ne II	100	378.14	Na III	300	388.61	Fe V
200	349.50	K V	120	362.833	N III	20	378.53	Sr IV	3	388.66	In V
100	349.65	Y V	150	362.881	N III	110	378.56	P V	200	388.68	Sc V
2	349.75	Y V	150	362.946	N III	17	378.61	In V	300	388.82	Fe V
69	350.77	Ni V	90	362.985	N III	100	378.68	Sc V	14	388.91	In V
3	350.88	Ar V	150	363.02	K IV	30	379.12	K III	250	388.92	K IV
20	351.09	Mg V	250	363.49	Sr III	300	379.12	K V	2	389.03	La V
10	351.36	Y V	30	363.78	I V	3	379.24	In V	250	389.07	K IV
500	351.62	Sr III	77	363.96	Cu V	220	379.31	Ne III	250	389.07	K V
500 w	351.93	N IV	300	365.43	Fe V	300	379.59	Fe V	250	389.50	P V
500	351.98	N III	1000	365.59	Ne V	700	379.73	Br IV	11	390.03	In V
18	352.20	Mg V	69	365.62	Ni V	300	379.88	K IV	300	390.11	Fe V
450	352.92	Ca V	100	365.66	Ce V	400	379.96	Y V	250	390.11	K V
90	352.956	Ne I	300	365.86	Fe V	70	380.10	Na III	400	390.15	Cl V
700	353.06	N IV	2	367.40	Pb V	9	380.27	In V	300	390.19	Fe V
30	353.09	Mg V	400 p	368.18	Zr V	300	380.31	Fe V	250	390.42	K IV
15	353.30	Mg V	6	368.67	In V	25	380.48	K III	300	390.57	K IV
69	353.59	Ni V	1	369.52	Bi V	250	380.48	K IV	300	390.70	P V
100	353.98	Y V	6	370.10	In V	36	380.74	I V	400	390.72	La V
72	354.18	Ni V	300	370.42	Y IV	30	380.90	F II	300	390.78	Fe V
18	354.22	Mg V	70	370.62	Ni V	300	381.27	Fe V	11	390.92	In V
76	354.42	Ni V	65	370.63	Cu V	11	381.56	In V	200	391.46	K IV
68	354.49	Ni V	10	371.16	Sc IV	200	381.70	K IV	300	391.94	Fe V
300	354.93	K IV	150	371.21	Sr III	9	382.14	In V	300	392.06	Fe V
60	354.962	Ne I	120	371.299	P IV	30	382.23	K III	9	392.29	In V
110	355.14	O III	67	371.31	Ni V	300	382.23	K IV	300	392.38	Fe V
120	355.14	Sn V	150	371.504	P IV	150	382.49	K IV	500	392.43	Cl V
20	355.33	Mg V	250	371.69	C III	200	382.65	K IV	75	392.44	Sr IV

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
9	392.46	In V	35	403.85	Sr IV	800	416.20	Ne V	150	430.76	F IV
200	392.47	K IV	250	403.97	K IV	300	416.66	Fe V	50	430.91	F II
300	392.50	Fe V	150	404.21	Ce V	300	416.84	Fe V	3	431.03	Pb V
300	392.51	Fe V	300	404.36	Mn V	150	417.28	K IV	6	431.2	Bi IV
33	392.68	Ni IV	150	404.41	K IV	700	417.39	Fe V	150	431.54	Zn IV
300	392.70	Fe V	400	404.62	Fe V	9	417.43	In V	40	431.55	F II
300	392.91	Fe V	350	405.10	La V	30	417.54	K III	120	431.62	Zn IV
50	393.00	Sr IV	30	405.24	Cu IV	700	418.04	Fe V	1000	432.11	La V
500	393.14	K IV	3	405.33	In V	100	418.18	Y V	400	433.54	Mn V
32	393.24	Ni IV	400	405.50	Fe V	2	418.45	In V	10	434.41	Zn IV
300	393.27	Fe V	150	405.854	Ne II	500	418.47	Fe V	300	434.42	Fe V
1	393.60	In V	380	406.02	Mn V	150	418.59	Y V	600	434.57	Ca IV
300	393.72	Fe V	100	406.27	Cl III	30	418.62	K III	75	434.72	K III
300	393.73	Fe V	300	406.40	Mn V	285	418.7	B IV	300	434.98	O III
25	393.89	In V	80	406.45	Cu IV	400	419.52	C IV	150	435.02	Zn IV
300	393.91	Fe V	30	406.48	K III	140	419.65	F IV	2500	435.28	La V
70	393.91	Ni V	25	406.94	Cu V	500	419.71	C IV	1	435.63	Bi V
300	393.97	Fe V	35	406.94	Sr IV	30	419.78	Sr IV	40	435.64	F II
300	394.04	Fe V	40	407.04	F II	50	419.79	Y V	600	435.67	Mn V
66	394.31	Ni V	2	407.12	Ba III	350	419.80	Mn V	50	435.68	K III
2	394.38	Pb V	120	407.138	Ne II	150	420.05	F IV	150	435.76	Zn IV
300	394.64	Fe V	9	407.28	In V	7	420.12	Ba III	700	436.14	La V
45	394.90	Sr IV	3	407.36	In V	300	420.56	Fe V	350	436.16	Mn V
300	395.15	Fe V	800	407.42	Fe V	6	420.7	Bi IV	500	436.18	Mn V
66	395.24	Ni V	600	407.44	Fe V	160	420.73	F IV	80	436.25	Zn IV
400	395.32	Sc V	400	407.49	Fe V	300	420.74	Y V	30	436.38	Zn IV
250	395.40	K V	500	407.75	Fe V	500	420.77	N IV	3	436.60	Pb V
450	395.558	O III	9	407.95	In V	700	421.06	Fe V	2	436.67	Ar V
11	395.74	In V	250	408.08	K IV	3	421.55	La V	50	436.82	Zn IV
300	395.79	Fe V	12	408.684	Na IV	150	421.61	Ne IV	700	436.84	La V
400	395.90	Fe V	1	408.81	Y V	500	421.78	Fe V	300	437.11	La V
51	396.06	Cu V	40	408.96	K III	4	422.12	Ga IV	1000	437.24	Sr III
50	396.22	Sr IV	200	409.31	Y V	400	422.18	K V	100	437.27	Ca IV
4	396.87	Ar IV	10	409.614	Na IV	300	422.28	Fe V	5	437.4	S V
3	397.73	In V	400	409.71	Fe V	500	422.31	Fe V	700	437.55	La V
200	397.77	Y V	7	409.95	Ca III	50	423.07	La V	100	437.66	Y V
200	398.36	K V	150	410.03	P V	2	423.16	In V	250	437.77	Ca IV
1	398.53	La V	400	410.20	Fe V	25	423.18	Ga IV	400	437.83	Cl IV
4	398.55	Ar IV	600	410.30	Mn V	300	423.23	Fe V	20	437.88	Cd IV
15	398.63	K III	15	410.372	Na IV	30	423.42	Zn IV	250	438.02	K V
200	398.88	K V	600	410.60	Mn V	50	423.54	Zn IV	5	438.2	S V
30	399.34	La V	480	410.98	Mn V	4	423.84	Ba III	2	438.47	Pb V
300	399.36	Ce V	400	411.32	Mn V	49	424.40	Ni IV	100	438.62	Cr V
200	399.50	Sc V	10	411.334	Na IV	5	424.64	Pb V	450	438.74	Mn V
200	399.75	K V	400	411.37	Cl III	400	424.78	La V	9	438.80	Sc IV
10	399.79	In V	600	411.55	Fe V	750	425.00	Ca V	6	438.91	Pb V
300	399.84	Fe V	40	411.80	B III	600	425.03	Y IV	200	438.93	Ca IV
40	399.92	Sr IV	400	411.81	Cl III	300	425.16	K V	300	439.22	Fe V
9	400.05	In V	13	412.242	Na IV	500	425.59	K V	350	439.35	Mn V
300	400.11	Fe V	30	412.67	Zn IV	200	425.90	Zn IV	5	439.6	S V
400	400.21	K IV	460	412.74	Mn V	500	426.06	Fe V	5	439.69	Ca III
700	400.37	Br IV	30	412.93	Sr IV	500	426.11	Fe V	16	439.92	Ga IV
300	400.51	Fe V	40	413.07	Sr IV	300	426.83	Fe V	1	440.11	Ge IV
300	400.52	Fe V	40	413.45	Cu IV	350	426.97	Fe V	50	441.15	Zn IV
25	400.57	In V	460	413.75	Mn V	50	427.01	Cd IV	20	441.52	Zn IV
41	400.59	Ni V	50	413.79	K III	1	427.87	Y V	20	441.56	Zn IV
300	400.63	Fe V	120	414.604	P IV	200	428.54	Zn IV	3	441.62	Y V
1000	400.72	Na V	30	414.87	K III	600	428.59	Mn V	100	441.70	Zn IV
300	401.04	Fe V	200	414.999	P IV	80	428.79	Zn IV	1000	441.72	Mn V
300	401.64	Fe V	300	415.01	Fe V	500	429.05	Mn V	25	441.81	K II
300	401.86	Fe V	200	415.03	Y V	150	429.30	Zn IV	1	441.95	Ge IV
20	402.10	K III	250	415.05	K V	100	429.51	F III	200	442.30	K IV
25	402.39	In V	40	415.32	Sr IV	1	429.78	Bi V	200	442.39	Zn IV
300	402.87	Fe V	600	415.62	Mn V	110	430.15	F III	850	442.49	Mn V
300	402.91	K IV	200	415.79	K V	25	430.21	Sr IV	25	442.73	Sr IV
300	403.06	Fe V	250	415.805	P IV	80	430.22	F III	30	442.96	Y V
300	403.45	Y V	650	415.98	Mn V	200	430.59	Zn IV	1	443.11	Ce IV
9	403.72	Ca III	30	416.00	K III	30	430.65	Sr IV	300	443.57	K IV
5	403.82	Ba III	50	416.13	La V	50	430.75	Y V	70	443.68	Cu IV

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
750	443.82	Ca IV	300	458.16	Fe V	10	476.03	K II	600	493.48	Rb III
20	444.01	La V	3	458.16	Si IV	200	476.42	Zn IV	70	495.13	Cd IV
10	444.07	La V	2	458.98	Ar V	150	476.67	La V	30	495.14	K II
57	444.21	Ni IV	400	459.46	C III	20	478.29	Ta V	3	496.20	Pb V
250	444.245	P IV	500	459.52	C III	7	478.35	Pb IV	250	496.25	Kr V
75	444.34	K III	570	459.63	C III	200	478.65	Zn IV	10	496.38	Pb IV
150	444.39	Zn IV	600	459.90	Na V	200	478.90	Zn IV	10	496.72	Zn IV
100	444.46	Zn IV	1000	460.728	Ne II	15	478.97	Zr IV	90	497.00	Cu IV
300	444.70	Fe V	850	461.05	Na V	40	479.18	K III	75	497.10	K III
50	445.02	Ca IV	250	461.09	Ca IV	250	480.41	Ne V	60	497.23	Zr IV
200	445.040	Ne II	6 p	461.23	Ar V	60	480.66	Zr IV	50	497.38	F IV
500	445.05	Na V	7	461.41	Ti V	60	480.90	Cd IV	90	497.430	Rb II
300	445.158	P IV	3	461.70	Pb V	40	481.118	Rb II	100	497.70	Zn IV
600	445.19	Na V	500	462.391	Ne II	150	481.28	Ne V	50	497.82	Rb III
300	445.44	Fe V	3	462.42	Ar V	250	481.36	Ne V	60	497.83	F IV
200	445.61	K IV	10000	463.14	La IV	200	482.10	Zn IV	7000	498.08	La V
5	446.00	Ar V	1000	463.26	Na V	800	482.11	Br V	70	498.14	Cd IV
300	446.04	Fe V	80	463.72	Cu IV	10	482.11	K III	120	498.180	P III
300	446.256	Ne II	650	463.74	N IV	5000	482.16	La V	15	498.26	Ti V
100	446.58	Zn IV	1000	463.85	La V	10	482.41	K III	70	498.53	Cd IV
250	446.590	Ne II	7	463.94	Ar V	200	482.43	La V	70	498.80	F IV
250	446.83	K IV	100	464.02	Cr V	35 p	482.43	Rb III	4000	499.03	La V
8	446.95	Ar V	90	464.29	F III	30 p	482.47	Rb III	15000	499.54	La IV
4	447.53	Ar V	100	464.37	F V	10	482.68	Zn IV	12	499.94	Pb IV
2	447.58	Ce IV	80	464.55	Nb V	200	482.71	K V	60	500.22	Zr IV
180	447.815	Ne II	400	464.86	Cl IV	500	482.83	Rb III	100	500.28	Rb III
50	447.85	Cd IV	5	465.08	K II	200	482.96	Ce V	4	500.34	Zr IV
30	447.85	Zn IV	100	465.11	F III	500	482.99	Ne V	120	500.77	Kr V
75	448.60	K III	110	465.37	F V		483.	Li II	14	502.08	Ti V
750	448.60	K IV	30	465.85	Rb III	35	483.01	V V	10	502.42	Fe IV
9	448.95	Ba III	120	465.98	F V	2000	483.30	La V	7	502.71	Ti V
18	449.06	Ar V	75	466.79	K III	200	483.75	K V	10000	503.58	La V
10	449.13	Zn IV	200	466.93	Zn IV	8	483.99	Ti V	80	504.09	Cd IV
4	449.49	Ar V	100	466.99	F V	25	484.20	Sr IV	70	504.20	Cd IV
200	449.71	K V	400	467.32	Mn V	90	484.278	P III	70	504.50	Cd IV
200	449.98	Zn IV	30	467.35	Kr III	100	484.39	Kr V	90	504.60	Cu IV
1250	450.40	La V	80	468.32	Nb V	25	484.51	V V	12	504.66	Ti V
500	450.57	Ca IV	600	468.37	Br V	80	484.53	Cu IV	11	505.35	Fe IV
200	450.734	C III	150	468.43	Zn IV	90	484.60	F II	2	505.500	He I
200	450.99	Zn IV		469.50	K II	300	484.84	Rb III	3	505.684	He I
80	451.16	Cu IV	50	469.64	Cr V	65	485.42	Ni IV	4	505.912	He I
30	451.62	Zn IV	67	469.67	Ni IV	10	485.48	Zn IV	90	506.16	F V
250	451.869	N III	140	469.77	Ne IV	800	486.17	Cl IV	5	506.200	He I
2	451.97	Y V	200	469.82	Ne IV	300	486.17	Fe V	80	506.31	Cd IV
300	452.226	N III	180	469.87	Ne IV	70	486.884	Al III	7	506.47	Ti V
20	452.80	Zn IV	140	469.92	Ne IV	30	486.912	Al III	7	506.570	He I
200	452.90	K V	100	470.09	K III	30	487.227	Ar II	11	506.69	Fe IV
4	453.45	Pb V	90	471.146	P III	285	488.10	Ne III	1250	507.04	Sr III
7000	453.50	La IV	65	471.24	Ni IV	2	488.39	Bi V	10	507.058	He I
50	454.55	Ca IV	75	471.57	K III	10 d	488.58	Ti V	200	507.20	Kr V
150	454.654	Ne II	25	471.76	Sr IV	220	488.87	Ne III	800	507.391	O III
200	455.274	Ne II	40	471.95	F II	10	489.19	Zn IV	900	507.683	O III
250	455.67	K V	60	472.00	F II	10	489.49	Cd IV	15	507.718	He I
15	455.84	Y V	200	472.09	Zn IV	450	489.50	Ne III	60	508.01	Cd IV
	456.	Li II	150	472.16	Kr V	70	489.64	Ne III	100	508.08	F V
10	456.275	Ne II	200	472.66	Zn IV	500	489.66	Rb III	25 p	508.14	Sr IV
400	456.33	K IV	50	472.71	F II	100	489.96	Rb III	40	508.15	La V
400	456.33	K V	40	473.02	F II	220	490.31	Ne III	1000	508.182	O III
120	456.348	Ne II	200	473.02	Zn IV	130	490.57	F IV	30	508.33	Rb III
80	456.67	Zn IV	300	473.10	Y IV	50	490.650	Ar II	120	508.39	F III
90	456.896	Ne II	200	473.51	Zn IV	30	490.701	Ar II	20	508.434	Rb II
8	456.96	Ba III	200	474.56	Zn IV	10	490.96	Zn IV	20	508.643	He I
250	456.98	Ca IV	8	474.69	Ti V	160	491.00	F IV	50	508.95	Cd IV
70	457.18	F II	300	474.82	Mn V	360	491.05	Ne III	70	509.38	Cu IV
600	457.30	La V	10	474 88	Rb II	1875	491.79	Sr III	70	509.55	Cd IV
150	457.32	Zn IV	45	474.92	K III	1	492.72	Bi V	25	509.81	Cd IV
4	457.82	Si IV	8	475.36	Pb IV	70	493.00	Cd IV	3	509.99	Be III
85	457.84	Y V	375	475.60	P V	60	493.07	Ta V	25	509.998	He I
3	458.12	Ar V	50	475.78	Zn IV	10	493.37	Zn IV	20	510.77	B III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
40	510.85	B III	300	530.173	Rb II	520	542.57	P V	75	556.91	Cs III
250	511.138	Al III	50	530.79	Cd IV	80	542.60	Cd IV	700	557.12	Cl III
150	511.191	Al III	10	530.91	Fe IV	400	542.87	Cl V	8	557.50	Sc IV
70	511.40	Cd IV	10000	531.07	La V	40	542.887	Rb II	500	558.36	Rb III
250	511.522	C III	80	531.09	Cd IV	75	542.90	Cu III	5	558.48	Ar V
35	512.098	He I	7	531.26	Tl IV	2	542.90	Ge III	500	558.60	Ca V
	512.53	B V	80	531.51	Cd IV	30	542.912	Ar II	8	558.92	Ce IV
80	513.00	Cd IV	10	531.78	Fe IV	12	543.09	Nb IV	350	559.305	Cl II
150	513.266	Rb II	900	531.97	Br V	7	543.10	Ti V	1000	559.76	Br IV
8	513.37	Ti V	15000	533.23	La V	200	543.203	Ar II	10	559.94	Nb IV
50	513.64	F II	800	533.64	Rb III	7	543.34	Ti V	25	560.26	Cd IV
70	513.97	F V	75	533.801	Rb II	150	543.89	Ne IV	500	560.317	Al III
60	514.08	F V	25	534.19	Sr IV	10	544.20	Fe IV	200	560.433	Al III
3750	514.38	Sr III	70	534.29	Cd IV	6000	544.80	La V	700	561.53	Cl III
70	514.50	Cd IV	110	534.63	P V	600	544.92	P V	700	561.68	Cl III
70	514.94	F II	800	534.73	Cl IV	1000	545.11	Cl V	700	561.74	Cl III
10	514.94	K III	80	534.99	P V	12	545.21	Nb IV	2500	562.75	Sr III
9	515.07	Pb IV	250	535.288	C III	220	545.41	Hf V	3	563.62	Bi V
2	515.12	Si IV	10	535.55	Fe IV	1000	545.43	Br IV	100	563.72	Lu V
50	515.616	He I	700	535.67	Cl IV	15	546.12	K III	10	564.16	Cd IV
3	516.35	Si IV	10	535.84	Ti V	10	546.22	Fe IV	700	564.77	Rb III
400	516.79	Rb III	1200	535.86	Rb III	600	546.33	Cl V	150	565.46	Ca IV
10	517.28	Sr V	10	535.89	Ti V	80	546.55	Cd IV	45	565.53	I V
150	518.24	B III	600	536.15	Cl IV	70	546.85	F II	30	565.64	Kr III
75	518.27	B III	66	536.28	Ni IV	8000	547.44	La V	10	566.22	Nb IV
200	519.25	Zr V	200	536.50	Zr V	70	547.461	Ar II	8	566.61	Si III
20	519.3	S IV	300	536.53	Cl V	1000	547.63	Cl V	1500	566.71	Rb III
30	519.327	Ar II	14	536.61	Fe IV	60	547.87	F II	60	567.01	Cd IV
60	519.42	Cd IV	10	536.74	Fe IV	1000	547.90	Br V	120	567.69	F III
40	519.51	Cu IV	70	536.77	Cd IV	40	548.01	Cd IV	110	567.75	F III
40	520.04	Hf IV	400	537.01	Cl V	60	548.04	Kr V	250	568.038	P IV
20	520.1	S IV	400	537.030	He I	50	548.32	F II	400	568.42	Ne V
50	520.61	K III	15	537.10	Fe IV	20	548.33	Cd IV	30	569.16	Kr III
40	520.8	S IV	50	537.24	Cd IV	40	548.52	F II	1000	569.19	Br IV
15	520.97	Cd IV	13	537.26	Fe IV	10	548.80	Fe IV	50	569.19	Hf IV
120	521.74	Ne IV	300	537.46	Cl V	15	548.90	Cd IV	250	569.76	Ne V
140	521.82	Ne IV	900	537.61	Cl IV	500	549.22	Cl IV	500	569.83	Ne V
20	522.0	S IV	14	537.79	Fe IV	2	549.31	Be III	200	569.853	P III
3	522.09	Ar V	250	537.83	O II	700	549.77	Br V	20	570.16	Pb IV
100	522.213	He I	13	537.94	Fe IV	400	550.02	Cl IV	10	570.49	Tl IV
20	522.5	S IV	67	537.96	Ni IV	11	550.32	Fe IV	140	570.64	F IV
250	523.00	K IV	500	538.03	Cl V	60	550.92	Cu IV	3000	570.90	La V
7	523.05	Ti V	300	538.080	C III	20	551.2	S IV	140	571.30	F IV
25	523.79	K III	600	538.12	Cl IV	25	551.27	Cd IV	150	571.39	F IV
5	524.19	Ar V	350	538.149	C III	10	551.77	Fe IV	8	571.59	Ce IV
80	524.41	Cd IV	300	538.26	O II	700	552.02	Cl IV	400	571.904	Cl II
70	524.47	Cd IV	400	538.312	C III	40000	552.02	La IV	30	571.98	Kr III
12	524.58	Ti V	10	538.44	Fe IV	100	552.13	Ce V	250	572.11	Ne V
80	524.59	F V	400	538.68	Cl V	13	552.14	Fe IV	800	572.34	Ne V
50	524.77	Cd IV	220	539.09	O II	11	552.74	Fe IV	160	572.66	F IV
70	525.10	Cd IV	200	539.55	O II	20	552.90	Cd IV	1000	572.82	Rb III
60	525.19	Cd IV	15	539.71	K III	60	553.06	Cd IV	10	572.88	Fe IV
90	525.29	F V	150	539.85	O II	600	553.30	Cl IV	1000	573.36	Sc V
17	525.69	Fe IV		540.	Li II	700	553.330	O IV	70	573.362	Ar II
1500	525.71	La V		540.0	Li III	80	554.05	Cd IV	8	573.90	Pb IV
1000	525.795	O III	8 d	540.14	Ti V	775	554.075	O IV	350	574.281	C III
15	526.29	Fe IV	4000	540.20	La V	10	554.26	Fe IV	800	574.406	Cl II
100	526.30	F V	6	540.51	Sr V	2	554.50	Ar V	50	575.05	Cr IV
200	526.45	K IV	40	540.65	Cu IV	850	554.514	O IV	30	576.24	Cr IV
10	526.57	Fe IV	30	540.86	Kr III	700	554.62	Cl IV	1000	576.59	Br IV
13	526.57	Ti V	60	540.90	Cd IV	200	555.036	Rb II	30	576.62	Cr IV
13	526.63	Fe IV	80	541.13	Ne IV	700	555.261	O IV	1500	576.65	Rb III
12000	526.76	La V	8	541.46	Ti V	40	555.44	Lu V	30	576.736	Ar II
70	527.07	Cd IV	9	541.71	Ti V	14	555.48	Ba III	10	576.76	Fe IV
150	527.62	K IV	70	541.74	Cd IV	10	555.66	Fe IV	25	578.01	Sr V
6	527.69	Ar V	100	542.07	Ne IV	1200	556.19	Rb III	2500	579.63	Rb III
8	529.32	Ti V	800	542.23	Cl V	600	556.23	Cl III	10	579.76	Fe IV
14	529.78	Pb IV	600	542.30	Cl V	700	556.61	Cl III	60	579.79	Mn IV
40	529.80	K III	12	542.38	Nb IV	70	556.817	Ar II	30	579.83	Kr III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
70	580.263	Ar II	25	600.7	As V	60	614.23	Lu V	50	630.04	Kr III
750	580.32	K V	30	600.77	K II	285	614.3	Se V	250	630.06	Rb III
1500	581.26	Rb III	100	600.90	Hf IV	40	614.90	Cr IV	1000	630.14	Br IV
60	581.44	Mn IV	285	601.0	Se V	4	615.17	I IV	80	630.14	F III
60	581.65	Mn IV	1000	601.27	Br IV	30	615.34	Cr IV	90	630.20	F III
200	581.831	P III	500	601.50	Cl IV	30	615.60	Cr IV	80	630.30	Cr IV
6	582.08	Be III	50	601.54	Lu V	170	615.628	Ne I	500	630.71	Ni III
500	582.34	Rb III	5	601.86	I IV	200	615.67	Cu III	2000	630.97	Y V
30	583.437	Ar II	450	602.09	Rb III	40	616.0	As V	30000	631.26	La IV
250	584.15	Cs III	250	602.27	K V	150	616.03	Cu III	500	631.779	P IV
1000	584.334	He I	170	602.726	Ne I	25	616.09	V III	800	632.22	Br V
50	584.40	Cs III	30	602.858	Ar II	35	616.72	Kr III	30	632.62	Cr IV
8	584.52	Pb IV	1200	603.01	Cs III	50	616.82	Cr IV	35	633.09	Kr III
4	584.65	Zr IV	100	603.16	Hf IV	270	616.952	O IV	400	633.19	Cl V
8	584.83	Sc IV	400	603.43	K V	150	617.005	O IV	500	633.56	Zr IV
20	584.85	Cu IV	30	603.67	Kr III	200	617.036	O IV	100	633.58	Hf IV
4000	584.98	Y V	500	604.59	Cl IV	9	617.08	Sc IV	5	633.59	Ca III
1000	585.10	Br IV	50	605.23	Sn IV	500	617.60	La V	200	633.63	Zr IV
30	585.14	Kr III	50	605.51	Rb III	1000	617.85	Br IV	50	633.94	V III
60	585.21	Mn IV	90	605.67	F II	700	618.057	Cl II	3	635.12	Ar V
15	585.42	Zr IV	50	605.86	Kr III	40	618.23	Cr IV	400	635.32	Cl V
250	585.51	K V	80	606.29	F II	200	618.27	Hf IV	40	635.41	V III
30	585.96	Kr III	500	606.35	Cl III	170	618.672	Ne I	600	635.86	Cs III
500	586.24	Cl II	35	606.47	Kr III	50	619.04	Sn IV	800	635.881	Cl II
500	586.32	K V	81	606.79	Co IV	120	619.102	Ne I	285	636.0	Se IV
2	586.42	Zr IV	100	606.80	F II	40	619.13	Cr IV	1000	636.626	Cl II
1000	586.71	Br IV	70	606.92	F II	500	619.67	Rb III	30	637.34	Cr IV
800	586.77	Rb III	1000	607.03	Br IV	1000	619.87	Br IV	50 p	637.44	Lu V
35	587.213	Ne I	500	607.28	Rb III	600	619.982	Cl II	40	637.53	Lu V
14	587.57	Ba III	5	607.291	Cs II	50	620.00	Ga III	200	637.54	Ni III
600	587.94	Sc V	80	607.47	F II	100	620.19	Hf IV	50	637.55	Cr IV
60	588.89	Zr IV	14	607.53	Fe IV	800	620.298	Cl II	300	637.67	Cs III
35	589.179	Ne I	50	607.57	I V	300	620.4	Br III	120	637.87	Kr V
2500	589.419	Rb II	74	607.59	Co IV	100	620.66	Cr IV	400	637.93	Ca V
100	589.74	Zr IV	600	607.85	Cs III	20	620.83	Rb III	50	638.13	Cr IV
35	589.911	Ne I	25	607.93	K II	800	621.03	Br V	2000	638.17	Cs III
1	590.73	Bi III	800	607.94	Cs III	1500	621.15	Cs III	30	638.54	Cr IV
25	591.044	Cs II	90	608.06	F II	400	621.28	Cl III	250	638.67	K V
50	591.412	He I	55	608.24	Co IV	60	621.36	Cr IV	200	639.356	Cs II
100	591.42	Rb III	580	608.398	O IV	3	621.44	Hg III	50	639.98	Kr III
70	591.830	Ne I	220	608.7	Se V	40	621.45	Kr III	1000	642.23	Br IV
2500	593.18	La V	13	608.80	Fe IV	20	621.52	Ge V	25	642.23	Sr V
900	593.65	Rb III	400	608.90	Cl IV	40	622.01	Ga III	100	643.05	Hf IV
30	593.70	Kr III	66	609.16	Co IV	40	622.09	Cr IV	300	643.12	Ca V
30	594.10	Kr III	70	609.21	Co IV	100	622.24	Rb III	1	643.68	Y III
1000	594.94	Rb III	64	609.28	Co IV	45	622.80	Kr III	1500	643.878	Rb II
9	595.022	C II	10	609.65	Fe IV	30	623.54	Cr IV	150	644.148	O II
30	595.09	Cr IV	110	609.70	O III	6	623.77	Ar IV	200	644.54	Hf IV
10	595.18	Rb IV	640	609.829	O IV	520	624.617	O IV	285	644.634	N II
1300	595.88	Rb III	43	610.04	Co IV	30	624.93	Sr V	360	644.837	N II
100	595.920	Ne I	160	610.04	O III	50	625.02	Kr III	450	645.178	N II
285	596.0	Se V	37	610.25	Co IV	40	625.04	Cr IV	700	645.44	Br V
30	596.41	Kr III	200	610.75	O III	580	625.130	O IV	500	645.67	Rb III
100	596.56	Hf IV	24	610.79	Co IV	100	625.68	Ni III	2	645.76	Si IV
4	597.01	Tl IV	100	610.85	O III	30	625.76	Kr III	750	646.19	K IV
1000	597.51	Br IV	450	611.1	Br III	640	625.852	O IV	60	646.41	Kr III
750	597.70	La V	50	611.12	Kr III	40	625.99	Cr IV	400	646.57	Ca V
70	597.700	Ar II	700	611.70	La V	700	626.735	Cl II	4	646.69	Y III
700	597.818	O III	400	612.07	Cl IV	200	626.823	Ne I	18	647.27	Ba III
1200	598.49	Rb III	30	612.372	Ar II	45	628.59	Kr III	400	647.39	Hf IV
75	598.706	Ne I	6	612.46	I IV	600	628.66	Zr IV	140	647.50	N I
35	598.891	Ne I	30	612.62	K II	50	628.73	Sn IV	70	647.67	F V
1000	599.598	O III	50	612.64	Cr IV	40	628.79	Lu V	100	647.77	F V
180	600.00	Hf V	4	612.786	Cs II	350	629.008	P IV	110	647.87	F V
2000	600.01	La V	360	613.0	Se V	100	629.26	Cr IV	250	647.88	Ca V
70	600.036	Ne I	400	613.31	Rb III	1000	629.730	O V	70	647.97	F V
1000	600.09	Br IV	40	613.75	Cr IV	200	629.739	Ne I	350	648.482	P IV
40	600.17	Kr III	10000	614.01	Cs III	50	629.74	Cr IV	10	648.50	Pb IV
5000	600.24	La V	40	614.03	Cr IV	400	629.914	P IV	50	649.21	Sr V

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
1000	650.894	Cl II	600	665.65	Hf IV	130	678.99	F IV	45	691.93	Kr III
3	650.90	Tl II	150	665.70	I II	160	679.21	F IV	350	692.70	N I
50	651.20	Kr III	200	666.011	Ar II	30	679.218	Ar II	50	693.13	V IV
250	651.55	Ca V	70	666.1	S IV	300	679.39	Zr V	20	693.5	S V
6	652.22	Si III	2500	666.25	Cs III	200	679.401	Ar II	1500	693.594	Cl II
40	652.5	S IV	100	666.55	Cr IV	400	679.60	Cs III	4	693.85	Y III
400	652.64	Br V	6	666.81	I III	800	679.62	Br V	100	693.92	Cr IV
360	652.7	Se IV	75	667.30	Cr IV	50	679.65	V IV	70	693.95	B II
40	653.0	S IV	50	668.386	Cs II	2	679.68	Hg III	10	694.0	Xe III
8	653.33	Si III	25	668.74	Y III	35	680.13	Kr III	4	694.42	Pb V
9	653.36	Ba III	500	669.70	Ca IV	2	680.28	Ge III	200	695.20	Y III
70	653.6	S IV	9	669.93	Sr V	40	680.3	S V	50	695.21	Cr IV
400	653.70	Cl IV	100	670.068	Al III	110	680.9	S V	50	695.61	Kr III
6	653.87	Y III	450	670.1	Se IV	230	681.272	O V	500	695.829	Al III
40	654.0	S IV	300	670.38	Cl III	40	681.6	S V	50	695.91	Pd III
130	654.03	F V	5	670.76	Bi III	400	681.92	Cl V	8	696.20	Pb V
285	654.2	Se IV	5 r	670.87	Tl II	1500	682.053	Cl II	400	696.217	Al III
4	654.22	I IV	3	670.88	Ge III	400	683.17	Cl V	15 r	696.30	Tl II
4	654.56	I IV	1000	670.946	Ar II	10	683.28	Ar IV	350	696.99	Br III
70	655.6	S IV	170	671.016	N II	1000	683.51	Br IV	3000	697.049	Rb II
2	655.80	I II	200	671.118	Al III	35	683.68	Kr III	5	697.55	Ca III
20	655.9	S IV	100	671.36	Hf IV	500	684.37	V IV	1000	697.72	Br IV
750	656.00	Ca IV	285	671.386	N II	100	684.45	V IV	30	698.05	Kr III
9	656.10	Pb IV	150	671.630	N II	15	684.53	In IV	20	698.5	Xe III
120	656.12	F III	160	671.773	N II	15	684.58	Cd III	10	698.69	Sb III
300	656.76	Ca V	3000	671.851	Ar II	500	684.996	N III	5	699.09	Ca III
130	656.87	F III	285	671.9	Se IV	80	685.141	Cu II	3	699.22	Sb V
10	656.98	Y III	40	671.98	Y III	7	685.31	In III	6	699.41	Ar IV
10	657.112	Cs II	170	672.001	N II	5	685.41	Ca III	800	699.43	Cs III
110	657.23	F V	40	672.34	Kr III	570	685.513	N III	5	699.89	Ca III
110	657.3	S IV	35	672.85	Kr III	70	685.544	O I	200	700.17	Ni III
140	657.33	F V	200	672.95	O II	650	685.816	N III	30	700.25	Lu III
800	657.54	Br V	1800	673.06	Cs III	5	686.2	S V	8	700.28	Ar IV
8	657.8	Xe III	300	673.13	Cl III	35	686.23	Sr V	6	701.39	Ca III
25	657.94	Cs III	5	673.48	Si III	45	686.25	Kr III	800	702.332	O III
40	658.3	S V	200	673.49	Hf IV	500	686.335	N III	800	702.822	O III
140	658.33	F III	150	673.77	O II	6	686.88	Bi V	900	702.899	O III
6	659.00	I II	9	673.8	Xe III	5	686.9	S V	200 p	703.03	Zr V
20	659.15	Sr V	450	673.90	P V	30	687.053	C II	150	703.40	Cs IV
50	659.72	Kr III	9	674.0	Xe III	40	687.12	Cr IV	20	703.73	Pb V
70	659.8	S V	4	674.10	Tl II	50	687.345	C II	1000	703.850	O III
1000	659.811	Cl II	200 p	674.13	Zr V	300	687.50	K V	3500	703.89	Cs III
8	660.1	Xe III	20	674.81	Rb III	800	687.55	Cs III	12	705.1	Xe III
360	660.286	N II	200	675.53	Zr V	25	687.64	Zr III	8	705.11	I III
40	660.9	S IV	8	675.59	Be III	1500	687.656	Cl II	3	705.35	Ar V
25	660.94	Sr V	140	676.12	F IV	450	687.68	Br III	200	705.49	Pd III
4	661.32	Be III	5	676.2	S V	150	687.98	Cu III	50	705.98	Cr IV
160	661.4	S IV	70	676.242	Ar II	45	687.98	Kr III	4	706.29	Pb V
1000	661.53	Br IV	35	676.57	Kr III	200	688.27	Zr V	1	706.54	Bi V
1300	661.841	Cl II	9	676.6	Xe III	7	688.39	Ar IV	6	707.66	Pb V
500	661.867	Ar II	500	676.94	Ni III	50	688.46	Cr IV	150	707.80	Pd III
200	662.37	Ni III	110	677.00	B III	10	688.74	Pd III	50	708.36	Kr III
2000	663.074	Cl II	160	677.14	B III	400	688.93	Cl V	20	708.84	K III
110	663.2	S V	130	677.15	F IV	12 p	689.01	Ar IV	600	708.85	Kr V
50	663.29	Lu V	500	677.19	Br III	20	689.46	Pd III	220	709.2	Se III
150	663.57	Ni III	150	677.22	F IV	50	689.54	Pd III	5	709.20	Ar V
40	663.7	S IV	5	677.3	S V	5	689.8	S V	5 r	709.23	Tl II
25	663.76	Rb IV	8	677.33	In IV	400	690.2	Br III	100	709.313	Cu II
2	663.77	Ge III	1	677.34	Lu III	50	690.39	Zr III	220	709.4	Se III
450	663.82	Cs III	200	677.34	V IV		690.86	Kr V	200	709.80	Ag III
8	663.98	I II	8	677.39	Cd III	7	691.05	Lu III	100	709.89	Pd III
200	664.43	Sr IV	40	677.55	Cr IV	10	691.18	Sb III	1000	710.25	Cs III
8	664.52	I II	1000	677.63	Zn III	1	691.20	Sb II	100	710.35	Sr IV
30	664.562	Ar II	300	677.8	Br III	100	691.53	V IV	6000	711.187	Rb II
450	664.60	Cs III	30	677.952	Ar II	5000	691.60	Cs III	300	711.68	Br II
40	664.8	S IV	750	677.96	Zn III	5	691.62	In III	8	712.49	Zr IV
30	664.86	Kr III	20	678.1	S V	5	691.7	S V	30	712.90	Cr IV
8	665.06	I II	60	678.74	V IV	100	691.72	Y III	300	713.33	Ni III
500	665.54	Br III	2	678.87	Bi V		691.75	Kr V	300	713.38	Ni III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
90	713.518	N V	6	728.81	Fe III	12000	740.29	Cs III	90	754.39	Zr IV
200	713.85	Ag III	2	728.83	Y III	200	740.33	Zr V	30	754.60	Ce IV
150	713.860	N V	2500	728.951	Cl II	350	740.41	Xe II	400	754.67	K IV
200	713.90	Zn III		729.	Li II	8	740.55	Ca III	200	755.03	Lu III
	714.0	Be II		729.1	Li III	2000	740.61	Zr V	3	755.16	Lu III
50	714.00	Kr III	60	729.40	Kr II	50	740.85	Rb IV	1500	755.18	Cs III
50	714.89	Lu III	70	729.5	S III	200	740.98	Ag III	150	755.73	Ag III
1000	715.39	Br IV	20	729.73	Y III	100	741.45	Pr IV	12	755.75	Ce IV
120	715.5	As V	500	729.82	Ni III	10000	741.456	Rb II	10	755.80	Pb V
150	715.53	Cu III	5	730.00	Fe III	35	741.52	Ge V	35	755.84	Ge V
	715.55	Cl V	350	730.04	Ag III	40	741.79	Ce IV	10	756.0	Xe III
4	715.60	Ar V	250	730.11	Ni III	220	741.9	Se III	300	756.510	P IV
3	715.65	Ar V	150	730.28	Ag III	500	741.95	K IV	100	756.85	Pd III
6	715.79	Sr V	50	730.37	Pr IV	150	742.23	Cs III	60	757.04	F V
	716.19	Cl V	125	730.38	Cu III	200	742.29	Ag III	100	757.41	Pd III
25	716.24	Rb IV	600	730.49	Y III	15	742.6	Xe III	300	757.80	Ni III
35	716.26	Ge V	10	730.60	Sc III	500	742.74	Zr V	250	758.27	Ni III
300	717.24	Zr V	5	730.71	Bi V	15	743.12	Ba III	100	758.27	Ag III
100	717.73	Ag III	25	730.83	Ag II	20	743.15	Pr IV	40	758.48	B III
100	717.90	Pd III	5	730.85	Pb V	5	743.58	Be II	70	758.67	B III
200	718.090	Ar II	70	730.930	Ar II	400	743.720	Ne I	700	758.678	O V
1500	718.138	Cs II	150	730.94	Ag III	20	743.89	Pr IV	250	758.73	Ni III
100	718.179	Cu II	15	731.0	Xe III	3	744.19	La III	1200	758.82	Cs III
20	718.23	Pr IV	1000	731.00	Br IV	70	744.794	O I	285	759.0	Se IV
500	718.48	Ni III	40	731.36	B II	110	744.9	S IV	450	759.1	Se V
900	718.484	O II	40	731.44	B II	200	744.925	Ar II	640	759.441	O V
200	718.53	Ag III	5000	731.56	Cs III	400	745.21	Cl IV	30	759.54	Rh III
600	718.562	O II	15	731.65	Sc III	500	745.26	K IV	6	759.90	Cs III
100	719.47	Pd III	400	731.70	Ni III	70	745.322	Ar II	60	760.05	Ge V
1000	719.55	I II	30	731.77	Pr IV	1	746.06	Sb V	90	760.15	Zr IV
300	720.43	K V	600	731.86	K V	20	746.14	Pr IV	580	760.228	O V
220	720.6	Se III	300	731.95	Cs III	7	746.23	Be III	775	760.445	O V
8	720.64	In IV	300	732.16	Ni III	6	746.25	Ca III	50	760.62	Sn III
10	720.70	Cd III	15	732.33	Sb III	10	746.28	Rh III	10	761.09	Pb IV
10	721.2	Xe III	110	732.42	S III	400	746.35	K IV	640	761.128	O V
200	721.26	Ni III	15	732.70	Y III	450	746.4	Se IV	200	761.18	Kr II
30	721.34	Pr IV	15	733.29	La IV	30	746.70	Kr III	165	761.24	As II
20000	721.79	Cs III	10	733.3	Xe III	60	746.88	Ge V	8	761.43	Sc IV
100 p	722.04	Kr III	20	733.41	Rb IV	285	746.984	N II	5	761.47	Ar IV
300	722.09	Ni III	35	733.54	Ge V	12	747.82	Sr V	10	761.5	Xe III
20000	722.20	Cs III	800	734.36	Y III	5	747.98	Ca III	700	762.003	O V
60	722.41	Pr IV	285	734.6	Se IV	300	747.99	Ni III	6	762.76	Pb V
30	722.58	Pr IV	150	734.8	As V	150	748.195	N V	500	763.06	Pd III
220	722.8	Se IV	30	734.86	Pr IV	200	748.291	N V	10	763.14	Ta IV
15	722.86	Sb III	20	735.04	Pr IV	200	748.30	Ag III	40	763.16	Pr IV
1000	722.98	I II	70	735.2	S III	110	748.4	S IV	500	763.336	N III
3000	723.361	Ar II	35	735.35	Ge V	12	749.46	Pb V	80	763.77	Nb V
50	724.21	Ge V	200	735.520	Cu II	200	749.68	Ni III	100	763.98	Kr II
360	724.3	Se III	1000	735.896	Ne I		749.74	B V	20	764.00	Pr IV
400	724.42	K V	250	736.032	Cu II	20	749.86	Rb IV	570	764.359	N III
150	724.489	Cu II	20	736.19	Pr IV	1000	749.94	Cs III	1	764.43	Sb II
8	724.81	Sb III	50	736.32	Pr IV	5	749.94	Si IV	300	764.58	Zr V
25	724.92	La IV	300	736.4	Br III	300	749.99	K IV	570	765.148	N IV
2	725.11	Ar V	200	736.57	Ag III	300	750.05	Ni III	20	765.31	K III
250	725.20	Ni III	1000 p	736.66	Cs III	150	750.11	V IV	30	765.64	K III
2000	725.271	Cl II	500	737.14	K IV	110	750.2	S IV	10	765.87	Pb V
500	725.548	Ar II	100	737.17	Pr IV	40	750.26	Ge V	60	766.20	Kr II
4	725.59	Be III	60	737.2	As V	1500	750.38	Cs III	500	766.20	Zr V
200	725.683	Al III	220	737.2	Se III	200	752.02	Ni III	500	766.42	Pd III
5	725.71	Be II	5	737.71	Fe III	300	752.48	Zr V	200	767.19	Ag III
20	726.04	Pr IV	400	737.85	V IV	10	752.52	Pb V	18	767.45	Pb V
285	726.4	Se III	100	738.13	Ag III	30	752.80	Ag II	2	767.75	Be III
300	726.915	Al III	10	738.17	Bi V	60	753.01	Nb V	250	768.33	Ag III
300	726.96	Ag III	200	738.26	Ni III	100	753.01	Sn III	5000	769.04	Rb III
300	727.0	Br III	70	738.5	S III	10	753.03	La III	10	769.1	Xe III
5	727.66	Ca III	100	738.76	Lu III	20	753.75	Rb IV	12	769.15	Ar III
200	727.72	Pd III	150	738.79	Pd III	110	753.8	S IV	18	769.49	Pb V
9	727.91	Y III	5	739.26	Fe III	150	754.19	K IV	150	769.61	Ag III
4	728.47	Y III	200	740.269	Ar II	4	754.20	Ar IV	250	769.63	Br III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
8	769.70	Sc IV	285	786.5	S V	10	801.09	Ar IV	1	814.85	Sb II
400	770.22	Ni III	1	786.64	La III	150	801.14	Cu III	7	815.05	Si IV
150	770.29	K V	10	787.05	Pb V	10	801.41	Ar IV	2500	815.28	Rb III
15	770.78	Y III	200	787.14	La III	5	801.91	Ar IV	250	815.48	Br II
70	770.793	O I	200	787.31	Pd III	75	801.95	Cs III	110	816.0	S IV
200	771.03	Kr II	5000	787.580	Cl II	15	802.0	Xe III	150	816.12	Ag III
90	771.056	O I	640	787.711	O IV	18	802.07	Pb IV	120	816.232	Ar I
14	771.42	Pb V	300	787.73	Cs III	200	802.200	O IV	70	816.464	Ar I
150	771.46	K V	200	787.95	Pd III	160	802.255	O IV	100	816.81	Hf V
10	771.54	Rb IV	300	788.04	Ni III	8	802.28	Te II	18	816.82	Kr IV
250	771.544	N III	250	788.07	Cu III	12	802.82	Pb IV	5	817.06	Ca III
10	771.79	Y III	200	788.30	Ni III	165	802.83	As II	10 r	817.18	Tl II
300	771.901	N III	250	788.46	Cu III	20	802.859	Ar I	90	817.30	Ga III
200	772.04	Ni III	5000	788.740	Cl II	350	803.07	Xe II	15	817.35	Cs III
200	772.11	Pd III	30	788.78	Au III	6	803.65	Bi III	250	817.79	Br III
350	772.385	N III	70	789.0	S III	500	803.67	Pd III	9	817.92	Rb IV
200	772.891	N III	8	789.00	Sc IV	285	803.8	Se IV	50	817.95	Au III
150	772.975	N III	200	789.08	Ag III	70	804.0	S IV	8	818.13	Si IV
7	773.61	Cs IV	200	789.58	Pd III	20	804.26	Y III	60	818.15	Kr II
60 p	773.69	Kr II	520	790.109	O IV	90	804.267	O I	25	819.59	Zr III
200	773.80	Zr V	700	790.199	O IV	285	804.3	Se V		820.	Li II
80	774.02	Nb V	6	790.5	Bi IV	70	804.848	O I	40	820.06	Au III
520	774.518	O V	6	790.6	Bi IV	200	805.01	Ni III	8	820.09	Pb V
4	775.16	Bi III	220	790.8	Se III	10 h	805.10	Si II	80	820.124	Ar I
70	775.321	O I	250	791.36	Cu III	5000	805.20	Y III	30	820.21	Zr III
8	775.37	Be II	8	791.71	Sc IV	70	805.295	O I	10	820.3	Bi IV
200	775.58	Zr V	12	791.88	F I	7	805.76	Kr IV	800	820.34	Cs III
75	775.79	Sn III	70	791.973	O I	80	805.810	O I	20 h	820.52	Si II
650	775.965	N II	250	792.35	Ag III	75	806.18	Y III	220	820.7	Se V
300	776.353	P IV	8	792.5	Bi IV	100	806.471	Ar I	20	820.86	V V
350	776.38	Ag III	10	792.54	F I	90	806.51	Ga III	6	821.57	Ca III
285	776.5	Se IV	15	792.9	Xe III	60	806.869	Ar I	500	822.06	Zr V
200	776.51	Pd III	5000	793.342	Cl II	10000	806.89	Zr V	8	822.07	Pb IV
10	776.76	Ti IV		793.44	Kr IV	150	806.96	F I	4	822.16	Ar V
25	776.89	Rb IV	500	794.08	Pd III	30	807.218	Ar I	180	822.39	Ag III
285	777.3	Se III		794.11	Kr IV	9	807.55	Fe III	9	822.9	Bi IV
2000	777.562	Cl II	10	794.42	F I	40	807.653	Ar I	1	822.97	Ge II
35	778.53	K III	40000	794.89	Ba IV	8	807.86	Fe III	650	823.179	P IV
500	778.81	Ni III	8	795.52	I III	360	808.7	Se V	25	823.2	Xe III
18	779.07	Ti IV	1	796.03	La III	1500	808.761	Cs II	9	823.41	Si III
25	779.1	Xe III	12	796.1	Xe III	8	808.84	Fe III	300 p	823.46	Zr V
200	779.21	Zr V	200	796.54	Ag III	300	808.88	Ag III	4	823.64	Cs IV
80	779.295	Cu II	300	796.66	O II	150	808.97	Y III	35	823.69	Zr III
5	779.61	Ca III	70	796.7	S III	125	809.60	F I	200	823.78	Zr V
30	779.73	Au III	400	796.99	La III	18	809.63	Pb V	700	824.730	P IV
200	779.734	O IV	15	797.02	Pb V	70	809.7	S IV	150	824.80	Cs IV
315	779.821	O IV	10	797.03	La IV	200	809.75	Zr V	12	824.9	Bi IV
360	779.912	O IV	1	797.20	La III	7000	809.92	Y III	70	824.9	S III
200	779.997	O IV	400	797.23	Zr V	50	809.927	Ar I	30	824.9	Xe III
15	780.39	F I	100	797.455	Cu II	5	809.93	Ca III	200	825.13	Zr V
10	780.52	F I	500	797.52	Pd III	10	810.24	P II	120	825.346	Ar I
2000	781.02	Pd III	4	797.53	Th IV		810.70	Kr V	500	825.35	Pd III
16	781.73	Ti IV	250	797.91	Ag III	500	810.73	Lu III	5	825.52	Pb V
200	782.10	Kr II	1000	798.16	I II	150	810.998	Cu II	50	825.60	Cr V
1	782.17	In III	40	798.3	S IV	8 p	811.28	Fe III	200	825.99	Cs III
10	782.38	F I	400	799.41	Ag III	500	811.57	Ni III	30	826.01	Rh III
14	782.79	Pb V	6	799.60	Te II	40	811.83	Au III	500	826.14	Ni III
200	782.91	Ag III	5	799.80	Pb V	10000	812.05	Zr V	120	826.365	Ar I
100	783.72	Kr II	50	799.93	Au III	5	812.32	Pb V	200	826.50	Ni III
400	784.50	Zr V		800.	Li II	10	812.59	Pb IV	300	826.996	Cu II
7	784.64	I III	10000	800.00	Zr V	700	812.95	Br V	5	827.05	Ar V
50	784.68	Sn III	500	800.03	Pd III	10	813.38	Fe III	3	827.35	Ar V
7	784.80	I III	5	800.07	Si III	50	813.44	Rh III	10	827.41	Pb IV
200	784.99	Pd III	500	800.10	Pd III	1000	813.66	Br IV	800	827.932	P IV
200 d	785.02	Ni III	1000	800.12	Br IV	1500	813.837	Cs II	285	828.5	Se II
10	785.12	Sc IV	5	800.30	Ca III	200	813.883	Cu II	50	828.70	Ga III
150	785.76	Ag III	40	800.41	Mg IV	200	814.02	Cs III	200	828.96	Yb IV
285	785.8	Se V	70	800.5	S IV	8	814.10	Pb V	8	829.32	Pb V
60	785.97	Kr III	5	800.57	Ar IV	220	814.8	Se V	100	829.34	Cu III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
30	829.48	V V	40	845.02	Ce III	350	855.624	P III	10	865.44	P II
25	829.50	Zr III	150	845.038	P III	100	855.64	Y III	450	865.45	P V
2	829.60	Ga II	100	845.14	Au III	5	855.68	Bi V	20	865.53	Mo IV
360	830.3	Se V	400	845.24	Ni III	350	856.19	Br II	7000	865.90	Pr V
60	830.38	Kr II	9	845.41	Fe III	100	856.32	Hf V	5	865.97	I III
7500	830.39	Cs III	30	845.62	La III	150	856.32	Ru III	185	866.3	As III
100	830.53	Lu III	250	845.664	P III	500	856.47	Pd III	30	866.74	Mg IV
200	830.59	Zr V	40 h	845.77	Si II	500	856.746	Al III	180	866.800	Ar I
100	830.69	Hf V	360	845.8	Se V	200	857.09	Ni III	70	866.93	Lu V
6	831.00	Sb V	12	845.94	Pb IV	150	857.29	Mg IV	10	867.10	Pb V
400	831.43	Cl IV	2	846.04	Pb II	18	857.64	Pb IV	270	867.25	Hf V
2000	832.28	Lu III	150	846.40	Zr IV	10	857.75	Mo IV	50	867.48	Ru III
12	832.60	Pb IV	100	846.87	Hf V	60	857.82	Y III	300	867.51	Ni III
360	832.7	Se II	30	846.91	Th IV	110	857.9	S V	50	867.92	Mo IV
240	832.762	O II	250	847.019	P IV	10	858.092	C II	3	868.30	Ge IV
600	832.927	O III	8 w	847.42	Fe III	200	858.30	Ce III	25	868.64	Zr III
80	833.16	Au III	300	847.43	Ni III	250	858.487	Cu II	40	868.74	Ce III
450	833.332	O II	300	847.669	P III	20	858.559	C II	60	868.87	Kr II
780	833.742	O III	3	847.80	Ge IV	8	859.02	Pb IV	1	868.99	Tl IV
1200	834.10	I II	600	847.80	I II	200	859.406	P III	25	868.99	Zr III
150	834.392	Ar I	20	847.88	Ce III	25	859.56	Zr III	5000	869.17	Pr V
600	834.467	O II	250	847.92	Cs III	500	859.652	P III	250	869.336	Cu II
500	834.84	Cl IV	200	848.016	P III	8	859.72	Fe III	20	869.51	Ce III
4 p	834.88	Ar V	120	848.465	P III	10	859.72	Mo IV	80	869.66	Pr V
500	834.97	Cl IV	150	848.639	P III	250	859.729	P III	200	869.70	Ni III
100	835.002	Ar I	150	848.808	Cu II	40	859.89	Rh III	150	869.754	Ar I
10	835.03	La III	30	849.08	Rh III	80	859.90	Au III	40	869.84	Ce III
3	835.08	Ge II	160	849.2	S V	400	860.15	Ce III	200	870.35	Yb IV
600	835.096	O III	1	849.39	Sb II	1	860.39	La III	2000	870.40	La III
800	835.292	O III	350	849.799	P IV	110	860.5	S V	50	870.40	Rh III
1	835.55	Th IV	6	849.86	Bi V	300	860.64	Ni III	14	870.44	Pb IV
2	836.13	Ar V	2 h	849.88	Pb II	2	860.88	La III	40	870.84	Kr III
70	836.3	S III	185	849.9	As III		861.	Li II	40	870.84	Lu V
5 r	836.34	Tl II	60	850.06	Lu V	8	861.24	Sc IV	200	870.84	Ni III
400	836.57	Zr V	250	850.09	Ru III	8	861.30	Sc IV	10	871.10	Ar III
100	836.74	Hf V	10	850.14	Si II	40	861.34	Rh III	20	871.15	Ce III
100	837.39	Cs III	15	850.18	Rb IV		861.5	Sb IV	40	871.27	Ce III
50	837.66	Kr III	200	850.30	Ru III	8 p	861.76	Fe III	600	871.39	P V
8	838.05	Fe III	200	850.392	P IV	100	861.80	Hf V	510	871.7	As III
200	838.11	Ag III	10	850.50	Ge II	15	861.83	Cs IV	20	872.31	K III
6000	839.297	Cl II	25	850.60	Ar IV	10 p	861.83	Fe III	30	872.43	La III
450	839.5	Se V	30	850.61	Zr III	100	861.92	Lu V	15	872.6	Bi IV
8000	839.599	Cl II	1	850.73	La III	400	861.994	Cu II	200	873.11	Zr V
15	840.03	Ar IV	1000	850.81	Br V	10	862.234	Ge II	150	873.263	Cu II
100	840.24	Ce III	200	851.18	Ce III	200	862.25	Ce III	8	873.46	Fe III
6	840.56	Ca III	50	851.22	Ru III	9	862.32	Sr V	1500	873.49	I II
500	840.58	Pd III	250	851.303	Cu II	16	862.33	Pb IV		873.5	Sb IV
400	840.81	Cl IV	5000	851.691	Cl II	60	862.58	Kr III	6	873.71	Pb II
600	840.93	Cl IV	5	851.98	Pb V	300	862.88	Ni III	10	873.86	K III
8	840.99	Pb IV	110	852.2	S V	3	863.00	Pb II	15	874.04	K III
200	841.31	Ta V	50	852.49	Ru III	300	863.22	Ni III	200	874.84	Cs IV
3000	841.40	Zr V	200	852.63	Ce III	80	863.42	Au III	15	875.493	Ge II
7000 p	841.41	Cl II	250	852.686	P III	20	863.63	Mo IV	9	875.53	Ar III
22	842.04	Kr IV	40	852.70	Rh III	300	863.65	Zr IV	180	875.88	Hf V
20	842.06	Be II	300 p	852.87	Zr V	50	863.78	Rh III	50	875.89	Lu V
500	842.14	Ni III	25	853.0	Xe III	20	863.97	Pb V	1000	875.94	I II
100	842.805	Ar I	200	853.47	Ce III	500	864.04	Pd III	180 r	876.058	Ar I
8	842.88	Pb IV	700	853.68	Zr V	100	864.27	V III	50	876.08	Kr III
360	843.0	Se III	60	853.78	Ce III	15 d	864.45	Bi V	50	876.45	Lu V
4	843.37	Cs III	1	854.02	Th IV	500	864.59	Zr IV	200	876.723	Cu II
100	843.44	Au III	50	854.73	Kr III	60	864.82	Kr II	8	876.8	Bi IV
30	843.63	Rh III	40	854.77	Rh III	30	864.86	Zr III	400	876.80	Lu IV
20 h	843.72	Si II	220	854.8	S V	5	865.04	La III	4	876.84	Sb II
20	843.77	Ar IV	400	855.034	Al III	135	865.16	Hf V	250	877.012	Cu II
200	843.78	Pr V	2	855.08	Sb II	50	865.22	Rh III	700	877.476	P IV
100	844.06	Kr II	200	855.16	Ce III	25	865.24	Mo IV	200	877.555	Cu II
20	844.11	Ce III	150	855.27	Br V		865.3	Be II	135	877.87	Hf V
10	844.28	Fe III	80	855.49	Au III		865.3	Cl IV	40	877.879	O I
200	844.646	P III	3	855.57	Pb II	400	865.390	Cu II	2	877.96	Pb II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
20	878.17	Ga V	1000	889.23	Br II	100	902.06	Lu IV	5	920.38	I III
10	878.43	Mo IV	1000	889.29	Pd III	300	902.46	Yb IV	20	920.554	Ge II
2	878.59	Hg III	15	889.3	Xe III	5	902.8	S V	12	920.66	Pb V
500	878.699	Cu II	8	889.68	Pb II	30	903.624	C II	50	920.92	Lu V
12	878.73	Ar III	100	889.72	Si II	60	903.962	C II	7	920.93	Bi III
220	879.2	Se III	600	890.567	Cu II	150	904.142	C II	4	921.07	Sb II
8	879.62	Ar III	16	890.72	Pb IV	30	904.480	C II	130	921.296	O IV
2000	879.84	I II	9	890.76	Fe III	135	904.95	Hf V	40	921.32	Lu V
180 r	879.947	Ar I	10	890.84	In III		905.5	Li II	160	921.366	O IV
12	879.96	Pb IV	8	890.87	Sc IV	20	905.9	S V	500	921.66	Cs III
6	880.17	Bi V	1000	890.87	Ta V	15	905.977	Ge II	270	921.67	Hf V
100	880.32	Lu V	1000	891.00	I II	500	905.99	Br II	50	921.78	Ru III
7	880.35	Pb IV	400	891.01	Kr II	400	906.113	Cu II	250	921.849	P III
135	880.37	Hf V	10	891.17	Fe III	285	906.6	Se II	60	921.90	Lu V
6	880.50	Pb V		891.2	Sb IV	500	906.66	Zr V	520	921.992	N IV
500	880.59	Pd III	8	891.44	Fe III	40	906.9	S II	520	921.992	N IV
20	880.68	Ce III	50	891.74	Mo IV		907.38	Mg II	80	922.008	O I
600	880.80	Xe II	100	891.81	Lu V		907.41	Mg II	600	922.019	Cu II
100	880.85	Hf V	200	892.00	Si II	50	908.22	Sn IV	10	922.12	Pb IV
200	881.30	Zr IV	400	892.024	Al III	12	908.51	Pb IV	750	922.29	Pr V
60	881.75	Ce III	20	892.39	Mn III	90	909.697	N I	12	922.49	Pb IV
1500	881.88	I II	500	892.414	Cu II	135	909.70	Hf V	500	922.519	N IV
10	882.24	In III	80	892.75	Ce III	80	910.278	N I	500	922.519	N IV
1000	882.34	La III	400	893.08	Hg II	80	910.45	Au III	300	922.56	Br II
30	882.39	Th IV	1000	893.17	I II	40	910.5	S II	40	922.73	Lu V
80	882.51	Rh III	2000	893.549	Cl II	40	910.645	N I	100	923.02	Cs IV
110	882.54	B II	800	893.678	Cu II	200	910.92	Sn III	480	923.057	N IV
200	882.59	Zr IV	50	893.887	Al III	200	911.39	Kr II	400	923.10	Zr V
110	882.68	B II	450	893.897	Al III	40	912.7	S II	200	923.367	O IV
20	882.72	La III	20	894.0	Xe III	3	912.74	Tl IV	150	923.39	Hg II
400	883.13	Cl V	400	894.227	Cu II	100	912.77	Ce III	130	923.433	O IV
9	883.18	Ar III	135	894.24	Hf V	360	912.9	Se II	50000	923.74	Ba IV
5	883.40	Si III	150	894.310	Ar I	10	913.01	Si II	12	923.9	Bi IV
20	883.6	S V	400	894.34	Cl V	135	913.68	Hf V	80	924.02	Au III
18	883.90	Pb V	14	894.40	Pb V	20	913.85	Si II	500	924.239	Cu II
60	884.04	Ce III	100	894.41	Hf V	300	913.971	P III	520	924.283	N IV
100	884.133	Cu II	40	894.80	Mo IV	800	914.213	Cu II	7	924.52	Pb IV
200	884.14	Kr II	100	894.91	Cl V		914.5	Cl V	2	925.25	Be II
100	884.19	Mo IV	60	895.01	Lu V	100	914.72	Lu V	6	925.48	Bi III
40	884.21	Lu V	40	895.15	Lu V	8	915.00	Ge IV		925.72	Au II
20	884.5	S V	15	895.41	Mo IV	8	915.09	Pb V	100	925.75	Rh III
	884.70	Mg II	20	896.0	Xe III	500	915.30	Zr V	80	925.79	Lu V
	884.72	Mg II	12	896.08	Pb V	450	915.612	N II	600	925.87	Xe II
10	884.82	Mo IV	180	896.14	Hf V	14	915.71	Pb V	15	926.226	H I
14	884.96	Pb IV	3	896.30	Pb II	300	915.83	Hg II	5	926.44	Pb II
14	884.99	Pb IV	100	896.47	Hf V	10	915.87	In III	4000	926.657	Cs II
20	885.22	Ce III	500	896.64	Br II	450	915.962	N II	5	926.83	In III
350	885.54	Xe II	1000	896.65	Pr V	550	916.012	N II	300	927.01	Yb IV
180	885.58	Hf V	600	896.759	Cu II	9	916.7	Bi IV	50	927.22	Lu V
90	885.67	N I	150	896.92	Cs IV	650	916.701	N II	325	927.5	As III
300	885.68	Zr V	400	896.976	Cu II	300	917.120	P III	10	927.64	Pb IV
5	885.8	S V	75	897.81	Kr III	8	917.31	Tl IV	135	928.01	Hf V
135	885.80	Hf V	1	898.02	Sb V	2	917.40	Sn II	250	928.08	Ru III
250	885.847	Cu II	40	898.42	Lu V	2000	917.43	Kr II	200	929.71	La III
60	886.05	Mo IV	20	899.32	Ce III	2	917.45	In III	30	929.78	Mg IV
70	886.16	Lu V	10	899.41	Si II		917.5	Li II	6	929.81	Bi V
1000	886.30	Kr II	8	899.42	Fe III	12	917.90	Pb IV	20	929.81	Si II
50	886.32	Lu V	135	899.70	Hf V	12	918.09	Pb V	20	930.748	H I
50	886.44	Lu V	1	899.92	Sn II	40	918.26	Lu V	135	931.50	Hf V
1	886.48	Hg III	5	900.36	Ar IV	135	918.48	Hf V	1000	932.054	Ar II
12	886.66	Th IV	300	900.48	Zr V	350	918.665	P III	14	932.20	Pb IV
600	886.943	Cu II	20	900.9	S V	50	919.03	Mg IV	25	932.67	Cs III
10	887.40	Ar III	80	901.03	Au III	180	919.10	Hf V	32	934.41	Ta IV
2000	888.026	Cl II	600	901.073	Cu II	7	919.28	I IV	90	935.193	O I
	888.3	Sb IV	9	901.17	Ar IV	25	919.59	Zr III	400	935.232	Cu II
14	888.37	Pb V	3500	901.270	Cs II	250	919.74	Ru III	250	935.40	Xe II
30	888.39	Ce III	180	901.54	Hf V	1000	919.781	Ar II	1	935.63	Sn II
500	888.84	Pd III	20	901.74	Si II	12	920.28	Pb V	600	935.898	Cu II
325	889.0	As III	135	901.92	Hf V	15000	920.35	Cs III		936.	Li II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
300	936.22	Yb IV	285	953.7	Se III	160	971.51	Hf V	450	984.9	Br III
100	936.28	Cl III	130	953.970	N I	90	971.738	O I	150	984.92	Ge V
8	936.70	Ge IV	12	954.35	Pb V	150	971.83	Ru III	500	984.93	Br II
8	937.00	Pb IV	200	954.383	Cu II		972.	Li II	700	984.95	Cl IV
40	937.04	Ce III	220	954.4	Se III	6	972.11	He II	20	984.95	Ga V
150	937.16	Ru III	4	954.50	Sn II	20	972.40	F I	7	985.13	Sn II
325	937.2	As III	220	954.7	Se III	250	972.40	Ru III	250	985.55	Ru III
150	937.28	Rh III	1000	954.83	F I	100	972.537	H I	400	985.75	Cl IV
40	937.4	S II	4	954.95	Pb V	9	972.56	Pb II	8	985.82	Fe III
40	937.7	S II	10	955.28	Pb V	10	972.66	Lu III	200	986.14	Cs IV
30	937.803	H I	1000	955.335	N IV	800	972.77	Xe II	10	986.71	Pb II
4	938.90	Ge IV	750	955.55	F I	20	973.16	Yb III	900	986.84	Ru III
7	939.09	Si III	500	956.25	Sn IV	500	973.21	Cl IV	1000	987.10	Gd IV
500	940.09	Ru III	250	956.290	Cu II	40	973.21	Ga V	50	987.29	Kr III
400	940.41	Zr V	50	957.06	Ru III	10	973.27	Be II	100	987.657	Cu II
250	940.68	Ru III	50	957.18	Ru III	100	973.54	Ru III	250	987.7	As V
6	940.74	Pb V	20	957.78	Au II	150	973.78	Ru III	200	987.87	Ru III
200	940.80	Hg II	400	958.154	Cu II	300	973.79	Ni III	1000	987.91	Gd IV
50	941.85	Ru III	60	958.51	Ge V	350	973.90	F I	15	987.96	Y III
6	942.62	Te II	500	958.52	F I	160	974.1	Se III		988.	Li II
50	942.63	Ru III	2	958.67	Ga II	750	974.14	Ru III	10	988.00	Rb IV
400	942.86	La III	5	958.70	He II	10	974.33	La III	200	988.13	Ge V
400	943.04	Yb IV	2	958.76	Pb II	250	974.46	Ru III	160	988.773	O I
50	943.06	Ru III	360	959.6	Se IV	3	974.47	Au II	1	988.89	Hg III
15	943.3	Bi IV	180	960.12	Hf V	135	974.62	Hf V	12	988.96	Ge III
600	943.335	Cu II	2	960.21	Pb II	200	974.759	Cu II	6	989.14	Pb V
10	943.56	Be II	400	960.4	Br III	360	974.8	Se III	15000	989.21	Y III
	945.	Li II	200	960.414	Cu II	6	975.20	Ce IV	40	989.75	Ga V
200	945.10	Au III	1	960.57	Ga II	200	975.21	Yb IV	900	989.790	N III
50	945.44	Kr I	1	961.01	Pb III	20	975.78	Sr III	8	989.8	Bi IV
600	945.525	Cu II	6	961.17	I III	100	976.12	Rh III	100	989.87	Si II
150	945.68	Ru III	2000	961.499	Cl II	100	976.22	F I	40	990.204	O I
3	945.83	Sn II	50	961.58	Ru III	40	976.448	O I	100	990.29	Ta V
500	945.965	Cu II	250	961.68	Ru III	40	976.51	F I	300	990.66	Ge V
	946.03	Au II	15	962.03	V V	700	976.68	Xe II	9	991.23	Fe III
100	946.05	Ru III	100	962.56	Ru III	800	977.03	C III	2	991.26	Lu III
8	946.20	Pb V	100	962.74	Hg II	250	977.51	Ru III	135	991.50	Hf V
400	946.20	Yb IV	50	963.37	Kr I	600	977.56	Cl IV	700	991.514	N III
50	946.54	Kr I	325	963.8	As III	250	977.567	Cu II	1000	991.579	N III
8	946.70	Mg II	130	963.990	N I	100	977.75	F I	500	991.62	Rh III
9	946.77	Mg II	4	964.38	Pb V	10	977.89	Ga V	250	991.67	Ru III
135	947.12	Hf V	115	964.626	N I	400	977.90	Cl IV	8	992.36	He II
100	947.14	Ru III	180	964.74	Hf V	200	978.06	Zr V	400	992.48	Rh III
500	947.30	Ta V	2000	964.97	Kr II	100	978.18	Ru III	200	992.68	Si II
300	947.78	Pd III		965.	Li II	40	978.284	Cl I	250	992.75	Ru III
40	947.80	Lu V	70	965.041	N I	900	979.43	Ru III	250	992.953	Cu II
40	948.686	O I	3	965.36	Pb II	400	979.59	Ni III	25	992.98	Sr III
75	948.84	V III	10	965.5	Xe III	15	979.60	Ga V	10	993.52	Si III
1000	948.97	Br II	300	965.52	Pd III	650	979.842	N III	60	993.54	Nb IV
350	949.0	Br III	500	966.54	Ru III	700	979.919	N III	60	993.88	Ne I
200	949.70	Zr V	250	967.09	Ru III	50	979.99	La III	900	994.56	Ru III
50	949.743	H I	10	967.23	Pb II	10 c	980.03	La IV	10	994.56	Yb III
100	949.83	Ru III	9	967.6	Bi IV	10	980.29	La III	13	994.79	Si III
10	950.33	Fe III	30	967.69	La III	200	980.70	Zr V	1000	995.04	Gd IV
50	950.35	Ru III	150	967.85	Ru III	18	981.27	Nb IV	50 p	995.14	Cs IV
	950.39	Au II	1000	967.92	Gd IV	500	981.35	Ru III	250	995.30	Ru III
100	950.45	Ru III	150	967.92	Ru III	10	981.37	Fe III	300	995.59	Zr V
1000	950.655	P IV	3	967.94	Au II		981.4	Be II	15	995.72	Ge III
6	950.93	Pb V	9	967.95	Si III	8	982.17	Pb II	1000	995.80	Gd IV
20	951.06	Kr I	250	968.042	Cu II	2	982.24	Au II	10	995.89	Pb II
245	951.62	Hf V	20	968.37	Sr III	1000	983.42	Gd IV	20	996.0	S II
500	951.87	F I	5	968.46	Yb III	6	983.57	Sb II	18	996.16	Nb IV
50	952.59	Ru III	50	968.70	Cr V	250	983.81	Ru III	25000	996.37	Y III
2	952.76	Ge III	8	968.8	Bi IV	10 w	983.88	Fe III	100	996.44	Lu III
7	952.85	Pb IV	50	969.13	Hg II	250	983.91	Ru III	1000	996.49	Gd IV
50	953.40	Kr I	2	969.19	Ga II	200	984.18	Zr V	10	996.50	Ge III
90	953.415	N I	20	969.26	Cr III	25	984.23	Y III	450	996.7	Se IV
325	953.6	As III	30	969.92	Cl I	120	984.64	Hf V	4	997.21	Sn II
100	953.655	N I	300	971.35	Ge V	40	984.67	B II	16	997.39	Si III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
250	997.62	P V	10	1010.08	C II	14	1025.96	Mg II	25	1039.99	Bi III
200	997.999	P III	500	1010.19	Nb IV	12	1026.11	Mg II	30	1040.17	Cr III
25	998.372	Cl I	300	1010.269	Cu II	25	1026.18	Pr III	40	1040.53	Cr III
25	998.432	Cl I	10	1010.37	C II	20	1026.28	Ce III	100	1040.63	Au III
2	998.52	Ga II	50	1010.92	Sn III	30	1026.41	Mg IV	4	1040.78	Sn II
50	999.101	Ge II	10	1010.94	Co V	8	1026.93	Be II	60	1040.942	O I
20	999.19	Y III	15	1011.21	Ge III	500	1027.34	Al IV	12	1040.99	Ge III
1000	999.24	Gd IV	40	1011.94	Sb III	90	1027.431	O I	20	1041.14	Ce III
40	999.26	Ce III	500	1012.10	Br II	500	1027.831	Cu II	16	1041.24	Pb IV
67	999.34	Ta IV	200	1012.22	Rh III	1	1028.08	Co V	1100	1041.31	Xe II
15	999.62	Sb III	10	1012.31	Ge III	500	1028.096	P IV	1	1041.32	Sn II
1000	1000.36	Gd IV	5	1012.38	Ga II	250	1028.328	Cu II	600	1041.60	Br V
150	1000.38	P V	8	1012.44	Pb IV	30	1028.33	Cr III	800	1042.17	Al IV
20	1000.5	S II	250	1012.597	Cu II	14	1028.61	Pb IV	100	1042.74	Ce III
150	1000.56	Y III	360	1013.4	Se II	30	1028.69	Tl IV	50	1042.96	Pr III
1200	1000.57	I II	150	1013.664	Cl I	100	1029.03	Pr III	25	1043.80	Pr III
200	1000.78	Ru III	10	1013.80	Co V	40	1029.37	Ce III	25	1044.03	Pr III
40	1000.86	Cr III	360	1014.0	Se II	250	1029.5	As V	18	1044.14	Pb IV
40	1001.04	Cr III	5	1014.27	Te II	100	1029.83	Lu III	80	1044.37	Mg IV
100	1001.06	Kr I	20	1014.4	S II	100	1030.02	Kr I	200	1044.41	Zr V
6	1001.13	Sb II	90	1014.47	Ga V	200	1030.263	Cu II	80	1044.49	Au III
400	1001.18	Lu III	500	1014.68	Ru III	45	1030.27	Nb IV	1000	1044.49	Sn IV
300	1001.65	Ru III	700	1015.02	Cl III	200	1030.33	Lu III	800	1044.519	Cu II
6	1001.81	Pb II	200	1015.17	Rh III	60	1030.47	Cr III	800	1044.744	Cu II
75	1002.346	Cl I	300	1015.18	Lu IV	3	1030.5	Pb III	50	1044.90	Nb V
400	1002.48	Zr V	1000	1015.54	Br II	570	1030.517	P IV	35	1044.91	Sr III
1000	1002.73	Gd IV	2	1016.26	Sn II	30	1030.89	Cr III	50	1045.04	Cr V
50	1002.76	Nb IV	10	1016.61	Pb II	7	1031.16	Si III	40	1045.06	Cr III
3	1002.95	Ga II	100	1016.638	Ge II	100	1031.54	Lu III	40	1045.14	Cr III
30	1002.96	Cr III	300	1016.66	Ge V		1032.	Li II	900	1045.71	Ge V
1000	1003.35	I II	50	1017.14	Cr III	20	1032.05	Pb IV	50 h	1045.76	Bi III
25	1003.35	Y III	9	1017.25	Fe III	8	1032.12	Fe III	25	1046.20	Pr III
35	1003.4	Xe III	50	1017.31	Cr III	500	1032.44	Xe II	80	1046.81	Au III
100	1003.55	Kr I	1	1017.43	Co V	8	1032.62	Ge III	150	1047.24	Pr III
250	1003.598	P III	50	1017.57	Cr III	500	1033.111	P IV	30	1047.50	Ga V
6	1003.73	Te II	35	1017.7	Xe III	50	1033.23	Cr III	300	1047.77	Zr V
300	1004.055	Cu II	8	1017.74	Fe III	50	1033.45	Cr III	10	1047.8	Xe III
250	1004.29	Ru III		1018.	Li II	20	1033.55	Ga V	1000 r	1048.220	Ar I
300	1004.38	Ge V	8	1018.29	Fe III	450	1033.6	Se II	15	1048.23	Be II
1000	1004.46	Gd IV	10	1018.36	Co V	100	1033.69	Cr III	1000	1048.27	Xe II
500	1005.28	Cl III	4000	1018.58	I II	8	1033.69	Ga II	700	1048.52	Al IV
15	1005.32	Ag II	500	1018.707	Cu II	8	1033.92	Si III	50	1048.84	Sn III
7	1005.37	Si III	100	1018.72	Ru III	20	1034.55	Ce III	40	1048.88	Cu III
8	1005.42	Pb V	8 r	1018.85	Tl II	5	1034.65	Ca III	12	1048.9	Pb III
1000	1005.66	Gd IV	3	1019.10	Ga II	10000	1034.66	I II	1000	1049.00	Br II
400	1005.72	Nb IV	100	1019.33	Ru III	20	1034.73	Tl IV	100	1049.09	Pr III
500	1006.46	V III	20	1019.5	S II	500	1035.517	P IV	10	1049.48	Tl IV
1000	1006.55	Gd IV	90	1019.71	Ga V		1035.60	K V	450	1049.6	Se II
1000	1006.58	Y III	500	1019.72	Sn IV	50	1035.93	Cr III	10 r	1049.73	Tl II
4	1006.86	Co V	6	1020.07	Ca III		1036.	Li II	500	1049.755	Cu II
40	1007.02	Nb V		1020.1	Be II	100	1036.03	Cr III	10	1049.82	Pb II
500	1007.05	Nb IV	25	1020.70	Si II	150 w	1036.16	N IV	100	1050.00	Rh III
1200	1007.24	Gd IV	100	1020.77	Ru III	5	1036.32	Be II	400	1050.05	Ge V
10	1007.51	Co V	10	1021.14	Co V	80	1036.337	C II	1000	1050.24	Yb IV
6	1007.80	Te II	50	1021.35	Pr III	600	1036.470	Cu II	8 r	1050.30	Tl II
1200	1007.86	Y III	340	1021.96	As II	20	1036.61	Tl IV	120	1050.48	Ga V
300	1008.569	Cu II	2	1022.12	Ce IV	150	1037.018	C II	10	1050.77	Pb II
25	1008.61	Pr III	1	1022.40	Lu III	500	1037.02	Br II	10	1051.26	Pb V
300	1008.728	Cu II	5	1022.79	Te II	7	1037.05	Si III	40	1051.6	As V
40	1008.76	Mg IV	50	1023.69	Si II	250	1037.41	Mg IV	50	1051.61	Ce III
600	1008.78	Cl III	5	1023.80	Ga II	700	1037.68	Xe II	30	1051.81	Bi III
15	1009.02	Co V	50	1025.23	Sr III	50	1038.29	Pr III	1200	1051.92	Xe II
500	1009.13	Ru III	20	1025.25	Ce III	250	1038.40	Ge V	6	1052.21	Sb II
2	1009.29	Hg III	15	1025.27	He II	400	1038.69	Zr V	50	1052.63	Pr III
5	1009.31	Ce IV	20	1025.29	Ce III	30	1038.76	Ga V	1000	1054.46	Yb IV
6	1009.43	Sb II	90	1025.553	Cl I	160	1039.230	O I	80	1054.56	Ga V
500 d	1009.60	Rh III	570	1025.563	P IV	50	1039.30	La IV	300	1054.59	Ge V
9	1009.86	C II	300	1025.722	H I	600	1039.348	Cu II	600	1054.690	Cu II
900	1009.87	Ru III	250	1025.762	O I	600	1039.582	Cu II	1500	1054.74	I II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
25000 c	1054.79	Cs III	25	1066.03	Pr III	100	1075.072	Ge II	800	1089.49	Ge V
12	1055.27	Fe II	200	1066.134	Cu II	3000	1075.21	I II	6	1089.94	Pb IV
60	1055.76	Mg IV	50	1066.23	Cr III	5000	1075.230	Cl II	30	1090.03	Ce III
400	1055.797	Cu II	2000	1066.34	I II	30	1075.82	Sb III	6	1090.11	Te II
80	1055.89	Cr IV	12	1066.4	Xe III	5000	1076.91	La III	300	1090.14	Al V
60	1056.13	Cu IV	500	1066.57	Al IV	285	1077.1	S III	350	1090.271	Cl I
8	1056.27	Sb II	8	1066.63	Si IV	120	1077.52	Y III	40	1090.53	Ga V
50	1056.53	Lu III	200	1066.64	Ta V	8	1077.66	Te II	8	1090.78	Au II
15	1056.53	Pb IV	500 r	1066.660	Ar I	5	1078.10	Sb III	250	1090.982	Cl I
10	1056.58	Sb III	80	1066.69	Ga V	100	1078.42	Hf V	50	1091.65	Cu IV
60	1056.6	As V	8	1066.96	Au II	6	1078.58	I III	90	1091.71	Ga V
600	1056.955	Cu II	68	1067.17	Ta IV	90	1078.71	N IV	300	1092.09	Ge V
6	1057.00	Te II	90	1067.614	N I	90	1078.83	Ga V	250	1092.437	Cl I
30	1057.05	Si II	100	1067.76	Ce III	5000	1079.080	Cl II	20	1092.48	Ce III
8	1057.32	Sb II	3000	1067.945	Cl II	30	1079.35	Ce III	400	1092.51	Yb IV
360	1057.4	Se II	5	1068.03	Hg III	110	1079.60	Ga V	160	1092.76	Hf V
70	1057.40	Ce III	20	1068.04	Tl IV	30	1079.68	Tl IV	3	1092.84	Lu III
15	1057.50	Si II	250	1068.26	Al V	5	1079.70	Tl IV	2	1092.90	Tl IV
10	1057.56	Tl IV	15	1068.36	Fe II	285	1079.8	Se III		1093.	Li II
100	1057.66	Ce III	80	1068.41	Cr III	7	1079.88	Pb IV	200	1093.54	Zr V
9	1057.67	Ce IV	300	1068.43	Ge V	100	1079.92	Hf V	8	1094.20	I III
20	1057.74	Sr III	400	1068.55	Zr V	200	1080.00	Ru III	100	1094.36	Ga V
60	1057.85	Cr IV	35	1068.59	Ga V	500	1080.54	Br V	300	1094.402	Cu II
90	1058.12	Ga V	60	1068.612	N I	18	1080.81	Pb IV	4	1094.41	Tl IV
100	1058.37	Sn IV	70	1068.65	Ne I	20	1080.82	Ce III	72	1094.60	Ta IV
100	1058.46	Ce III	100	1068.69	Ce III	60	1080.99	Ga V	360	1094.7	Se V
50	1058.59	Sn IV	25 p	1068.85	Pr III	500	1081.35	Y III	400	1094.769	Cl I
200	1058.63	La III	6	1068.86	Te II	50000	1081.61	La III	5	1094.92	Au II
400	1058.799	Cu II	150	1068.91	Cs IV	110	1081.88	B II	80	1095.10	Ga V
15	1058.88	Bi II	400	1069.13	Ge V	110	1082.07	B II	350	1095.148	Cl I
500	1058.90	Al IV	1000	1069.15	Br V	60	1082.31	F V	250	1095.25	Y III
12	1058.91	Ge III	500	1069.195	Cu II	340	1082.35	As II	350	1095.662	Cl I
100	1058.97	Rh III	4	1069.2	Pb III	6	1083.22	Si III	400	1095.797	Cl I
600	1059.096	Cu II	600	1069.44	Al IV	300	1083.45	Zr V	25	1095.87	Y III
60	1059.13	Cr III	30	1069.45	Ga V	600	1083.86	Xe II	9	1096.52	Pb V
4	1059.26	Pb V	60	1069.60	Ga V	450	1083.990	N II	20	1096.6	S II
8	1059.51	Te II	25	1069.88	Pr III	20	1084.06	Sb III	250	1096.810	Cl I
1	1059.64	Ce IV	20	1069.93	Sb III	20	1084.17	Pb IV	15	1096.89	Fe II
60	1060.15	Cr III	20	1070.43	Sb III	25	1084.42	Pr III	300	1096.92	Sn IV
25	1060.20	Sr III	20	1070.47	Tl IV	600	1084.580	N II	250	1097.053	Cu II
600	1060.634	Cu II	20	1070.54	Ce III	75 p	1084.63	Y III	13	1097.10	Cu V
60	1060.65	Cr V	9000	1071.036	Cl II	200	1084.667	Cl I	175	1097.237	N I
10	1060.66	Pb II	55	1071.19	Ga V	30	1084.94	He II	135	1097.28	Hf V
60	1061.04	Cr III	45	1071.41	Ga V	80	1085.00	Ga III	300	1097.369	Cl I
500	1061.43	Al IV	15	1071.60	Fe II		1085.00	Au II	12	1097.41	Ba III
25	1061.60	Pr III	6000	1071.767	Cl II	250	1085.01	Ga V	285	1097.8	Se II
20	1061.99	Lu III	500	1071.87	Br II	200	1085.171	Cl I	200	1098.068	Cl I
60 p	1062.09	La IV	12	1072.09	Pb IV	250	1085.304	Cl I	115	1098.095	N I
3	1062.10	Sn II	12	1072.23	Ag II	20	1085.47	Bi II	115	1098.260	N I
20	1062.23	Cd IV	300	1072.25	Zr V	300	1085.51	Ge II	10	1098.34	Sb III
	1062.67	Au II	1000	1072.59	La III	430	1085.546	N II	200	1098.71	Ge II
50	1062.68	Cr III	700	1072.66	Ge V	650	1085.701	N II	20	1098.77	Sr III
160	1062.7	S IV	200	1072.79	Ce III	71	1086.39	Ta IV	360	1099.1	Se III
50	1062.99	Ce III	160	1073.0	S IV	600	1086.65	Ge V	12	1099.12	Fe II
600	1063.005	Cu II	1000	1073.41	Sn IV	200	1087.05	Zr V	10	1099.20	Bi II
30	1063.26	Ce III	1	1073.44	Ge IV	80	1087.37	Ga V	20	1099.25	Ce III
50	1063.51	Ce III	70	1073.5	S IV	200	1087.50	Sn IV	800	1099.26	Hg II
65	1063.53	Ta IV	40	1073.69	Ce III		1087.6	Sb IV		1099.3	Sb IV
6000	1063.831	Cl II	300	1073.745	Cu II	500	1087.85	Ge V	7	1099.47	Pb IV
1200	1063.84	Gd IV	5	1073.76	Sb III	400	1088.06	Cl I	200	1099.523	Cl I
8	1063.87	Fe III	80	1073.77	Ga V	70	1088.39	F V	6	1099.60	Tl IV
30	1064.32	Cr III	6	1073.81	Sb II	350 p	1088.39	Y III	95000	1099.73	La III
30	1064.43	Cr III	200	1073.87	Rh III	200	1088.395	Cu II	100	1099.76	Zr IV
450	1064.76	Br II	250	1074.22	Ag II	40	1088.45	Ge III	150	1100.00	Zr IV
600	1064.89	Al IV	71	1074.47	Ta IV	25	1088.66	Pr III	68	1100.13	Ta IV
10	1065.49	Ag II	2000	1074.48	Xe II	500	1088.67	Al V	105	1100.360	N I
9	1065.58	Pb II	3	1074.7	Pb III	30	1088.70	Ce III	1200	1100.43	Xe II
200	1065.782	Cu II	30	1074.72	Cu IV	10	1088.86	Pb V	40	1100.465	N I
40	1065.90	Sb III	5 r	1074.97	Tl II	200	1089.35	Sn V	100	1100.58	Rh III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
30	1100.61	Cr III	1000	1116.94	Ge V	30	1132.75	Cr III		1145.9	Sb IV
5000	1100.70	La III	30	1117.19	Cr III	100	1132.79	Sn V	15	1145.91	Bi III
40	1100.71	Ce III	1500	1117.22	I II	14	1133.05	Ba III	4	1145.91	Pb II
90	1101.291	N I	80	1117.56	Cr V	10	1133.14	Pb II	12	1147.41	Fe II
30	1101.43	Cr III	900	1117.98	P V	15	1133.41	Fe II	15	1148.24	Sc III
250	1101.50	Br I	150	1118.16	Cd IV	12	1133.68	Fe II	15	1148.29	Fe II
70	1101.62	Ga V	50	1118.16	Cr V	59	1133.86	Cu V	30	1148.42	Ga V
40	1102.3	S II	80	1118.34	Ga V	40	1133.91	Ga V	54	1149.06	Cu V
160	1102.83	Ga V	570	1118.551	P IV	20	1134.08	Cd IV	615	1149.31	As II
30	1102.88	Cr III	4	1118.67	Pb III	360	1134.165	N I	7	1149.7	Bi IV
	1103.	Li II	600	1118.82	Al IV	385	1134.415	N I	75	1149.72	Ta IV
140	1103.03	Ga V	71	1118.83	Ta IV	5000	1134.43	Yb IV	500	1149.94	V III
150	1103.21	Y III	450	1119.2	Se III	300	1134.59	Br I	45	1150.09	Ga V
50	1103.24	Sn IV	3	1119.25	Ga II	410	1134.980	N I	130	1150.23	Ga V
20	1103.31	Au II	000	1119.34	Sn IV	10	1135.43	Sb III	90	1150.27	Ga III
24	1103.4	Bi IV	25	1119.43	Cu IV	130	1136.07	Ga V	300	1150.30	Al V
10	1103.94	Pb II	10	1119.57	Pb II	20	1136.17	Lu IV	75	1150.42	Ta IV
8	1104.32	Sb V	150	1119.947	Cu II	78	1136.17	Ta IV	12	1150.55	Ge III
6	1104.79	Pb V	150	1120.02	Nb IV	300	1136.24	Yb IV	220	1151.0	Se V
100	1104.84	Pr III		1120.4	Sb IV	250	1136.29	Br I	12	1151.16	Fe II
60	1104.93	Ga V	500	1120.46	Ge II	50	1136.67	Cr III	30	1151.49	Sb III
5000	1105.00	I II	200	1120.68	Sn IV	400	1136.82	Al IV		1151.5	Sb IV
30	1105.50	Cu IV	150	1121.07	Cr V	67	1137.06	Ga IV	12	1151.76	Ba III
60	1105.61	Ga III	67	1121.20	Cu V	135	1137.49	Hf V	75	1151.92	Ta IV
75	1105.62	Ga V	4	1121.33	Pb V	10	1137.50	Pb V	40	1152.152	O I
400	1105.74	Al IV	10	1121.36	Pb II	18	1137.84	Pb IV	40 p	1152.18	Cu IV
70	1106.17	Ga V	12	1121.99	Fe II	10	1137.92	Ge III	4	1152.36	Pb V
42	1106.24	Cu V	300	1122.01	Ge V	65	1138.20	Ga V	5	1153.10	Te II
500	1106.74	Ge II	8	1122.49	Si IV	66	1138.26	Ta IV	20	1154.52	Sc III
150	1107.03	Ag II	9	1122.53	Fe III	6	1138.6	Bi IV	20	1154.64	Cd IV
20	1107.09	Ce III	12	1122.86	Fe II	12	1138.64	Fe II	1500	1154.67	I II
500	1107.528	Cl I	55	1123.18	Ga V	20	1139.01	Bi III	6	1155.00	Si III
20	1108.16	Mn III	80	1123.66	Ga V	15	1139.04	Cd IV	10	1155.73	Cd IV
8	1108.19	Sn II	9	1124.88	Fe III	800	1139.214	Cl II		1155.9	Be II
14	1108.37	Si III	3500	1125.25	I II	1000	1139.29	Sn III	6	1155.96	Si III
20	1108.4	S IV	35	1125.49	Sr III	5	1139.30	Tl IV	220	1156.0	Se II
10	1108.43	Pb II	4	1125.52	Tl IV	500	1139.40	As II	70	1156.10	Ga IV
200	1108.79	Zr V	20	1125.58	Ce III	15 d	1139.46	Bi V	120	1156.51	Ga V
25	1108.82	Pr III	500	1125.61	Al IV	1200	1139.75	I II	285	1156.9	Se II
	1109.	Li II	30	1126.00	Cd IV	6	1139.8	Bi IV	400	1157.18	V III
10	1109.84	Pb II	120	1126.40	Ga V	10000	1139.80	I II	72	1157.54	Cu V
200	1109.96	Yb IV	20 h	1127.44	Si II	20	1140.24	Sr III	25	1157.58	V V
16	1109.97	Si III	150	1127.63	Cr V	200	1140.49	Ta V	40	1157.74	Sb III
200	1110.55	Yb IV	80	1127.75	Ga V	6	1140.55	Si III	35	1157.74	Ga V
20	1110.9	S IV	40 h	1127.91	Si II		1141.	Li II	12	1157.88	Pb V
2500	1111.16	I II	700	1128.01	P V	7	1141.58	Si III	150	1157.910	C I
20	1111.19	Ce III	8	1128.02	Fe III	360	1141.9	Se II	150	1158.019	C I
18	1112.09	Fe II	12	1128.07	Fe II	6	1142.28	Si III	150	1158.035	C I
900	1112.13	Br V	130	1128.10	Ga V	12	1142.33	Fe II	7	1158.10	Si III
70	1112.2	B IV	10	1128.34	Si IV	63	1142.38	Cu V	1000	1158.33	Sn III
50	1112.45	Cr V	120	1128.53	Ga V	100	1142.55	Ce III	75	1158.35	La IV
150	1112.46	Ag II	7	1128.55	Ti V	200	1142.640	Cu II	600	1158.47	Xe II
77	1113.22	Cu V	7	1128.8	Bi IV	15	1142.74	V V	30	1158.74	Kr III
18	1113.23	Si III	76	1128.80	Cu V	8	1142.77	Pb IV	4	1159.05	Sn II
15	1113.67	Ba III	20	1129.73	Ce III	20	1143.03	Be II	8	1159.15	Ge III
100	1113.79	Rh III	40	1129.76	F II	12	1143.23	Fe II	8	1159.62	Ge III
1	1113.87	Ga II	100	1129.94	Ga V	1000	1143.56	Br V	1000	1159.87	I II
60	1114.35	Cr V	10 r	1130.17	Tl II	105	1143.65	N I	6	1160.26	Si III
1	1114.69	Be III	30	1130.3	Xe III	6	1144.04	Te II	10000	1160.56	I II
	1115.1	Sb IV	12	1130.43	Fe II	3	1144.07	Tl IV	200	1160.74	Sn V
6	1115.30	Pb IV	5	1130.81	Ga II	60	1144.30	Ga V	300	1160.77	V III
40	1115.55	Ga V	20	1131.0	S II	8	1144.31	Si III	8	1160.79	Ge III
	1116.	Li II	80	1131.43	Ga V	300	1144.856	Cu II	200	1161.09	Sn III
11	1116.01	Ba III	2000	1131.50	I II	14	1144.93	Pb IV	10	1161.42	Te II
20	1116.08	Pb IV	20	1131.6	S II	18	1144.95	Fe II	50	1161.43	Cr III
100	1116.08	Nb IV	90	1131.72	Ne I	6	1144.96	Si III	10	1161.43	Sn II
79	1116.10	Ta IV	100	1131.85	Ne II	8	1145.11	Si III	8	1161.58	Si III
20	1116.30	Ce III		1132.1	Li II	7	1145.18	Si III	100	1161.58	Sn III
100	1116.48	Cr V	20	1132.74	Ce III	50	1145.70	Ga V	2	1161.95	Hg III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
20	1162.44	Sc III	77	1176.53	Cu V	80	1191.55	Cs II	200	1204.06	Sn III
15 r	1162.55	Tl II	30	1176.58	Tb IV	50	1191.72	Ge II	100	1204.57	Ru III
10	1162.59	Al III	105	1176.630	N I	50	1191.812	Al II	200	1204.88	Ru III
5	1162.62	Al III	200	1176.69	Ge V	30	1192.01	Tb IV	77	1204.90	Cu V
3	1162.94	Sn II	250	1177.23	Br I	250	1192.04	Xe I	50	1205.20	Sb III
8	1163.19	Bi II	40	1177.43	Al II	450	1192.3	Se II	220	1205.7	Se II
700	1163.39	Ge V	195	1177.695	N I	8	1192.35	Ti V	100	1205.72	Sn V
70	1163.60	Ga IV	8	1178.00	Si III	20	1192.41	Ce III	60	1206.38	Cr III
130	1163.884	N I	130	1178.65	Cs II	78	1192.52	Ta IV	200	1206.422	P IV
60	1164.206	N I	10000	1178.65	I II	76	1192.54	Cu V	30	1206.51	Si III
200	1164.27	Ge II	400	1178.90	Br I	80	1192.67	Ta IV	30	1206.53	Si III
50	1164.29	La IV	40	1178.95	Ga V		1192.9	Sb IV	72	1206.89	Ga IV
105	1164.325	N I	3000	1179.293	Cl I	300	1193.009	C I	500	1207.17	Ru III
100	1164.65	Cd IV	20	1179.73	Cd IV	73	1193.02	Ga IV	13	1207.29	Ba III
200	1164.87	Kr I	4	1180.51	Sn II	300	1193.031	C I	340	1207.44	As II
300	1165.26	Ge V	100	1180.62	Sn III	60	1193.23	Zn II	9	1207.52	Si III
350	1165.42	Al V	500	1181.19	Ge II	300	1193.240	C I	9	1208.54	Te II
20	1165.78	Cd IV	555	1181.51	As II	300	1193.264	C I	30	1208.80	La III
500	1166.01	Yb IV	500	1181.65	Ge II	200	1193.28	Si II	135	1208.88	Hf V
50	1166.07	Mo III	20	1182.09	Sr III	15	1193.29	Zn IV	80	1209.13	Cr III
	1166.4	Li II	500	1183.031	N III	100	1193.393	C I	185	1209.3	As III
20000	1166.48	I II	800 p	1183.05	Xe II	150	1193.649	C I	50	1209.60	Mo III
3	1166.76	Au II	15	1183.07	Cd IV	150	1193.679	C I	800	1209.76	Br I
12	1166.96	Sb III	30	1183.30	Mn III	100	1193.95	Cr V	500	1209.77	Ru III
4	1167.0	Pb III	100	1183.40	Cd IV	70	1194.0	S III	10	1210.46	Si III
1500	1167.05	I II	10 r	1183.41	Tl II	100	1194.064	C I	50	1210.50	Cr V
8	1167.06	Bi II	84	1183.63	Cu V	40	1194.13	Cd IV	2000	1210.52	Sn III
800	1167.148	Cl I	8	1183.64	Ti IV	300	1194.24	Zr V	50	1210.64	Sb III
40	1167.30	Cd IV	25 w	1183.86	Mn III	100	1194.488	C I	1000	1210.73	Br I
64	1167.35	Cu V	9000	1183.97	Zr IV	250	1194.50	Si II	5	1210.86	Au II
10 r	1167.43	Tl II	1000	1184.25	Sn III	20 p	1194.59	Lu IV	300	1210.99	Mg IV
270	1167.448	N I	100	1184.37	Ru III	12 r	1194.84	Tl II	80	1211.12	Cr III
1	1167.62	Ga II	570	1184.550	N III	75	1195.02	Ga IV	800	1211.17	As II
20	1168.27	Sr III	68	1185.23	Ga IV	10	1195.21	Ti IV	300	1211.31	Ru III
105	1168.334	N I	14	1185.43	Pb V	15	1195.29	I I	78	1211.94	Ta IV
60	1168.417	N I	600	1185.58	Yb IV	20	1195.63	Cd IV	70	1212.21	Nb V
250	1168.48	Al V	40	1186.06	Ga IV	60	1195.83	Ag II	30	1212.29	La III
285	1168.5	Se II	50	1186.80	Cu III	80	1196.04	Cr V	8	1212.47	Ge III
195	1168.536	N I	3	1186.81	Ga II	615	1196.38	As II	80	1212.68	Ta IV
25	1168.61	Sc III	5	1187.30	Ca III	30	1196.47	Cd IV	8	1212.71	Zn IV
10	1168.88	Sc III	15000	1187.34	I II	615	1196.56	As II	200	1212.71	Zr IV
450	1168.9	B IV	200	1187.34	Lu III	60	1197.19	Be II	5	1213.00	Te II
100	1169.33	Mo III	30	1187.65	Cr III	100	1197.39	Si II	100	1213.01	Zr IV
25	1169.40	Ga V	90	1188.01	N IV		1198.09	Li II	60	1213.08	Lu IV
250	1169.63	Xe II	8	1188.61	Ca III	500	1198.37	Br I	85	1213.09	Ta IV
75	1170.58	Ga IV	8	1188.61	Ca III	30	1198.49	Mn III	2	1213.12	Be III
12	1170.62	Ba III	200	1188.73	Ge II	400	1198.50	Al IV	80	1213.17	Ga V
70	1170.9	B IV	1200	1188.774	Cl I	9	1198.66	Ti V	500	1213.42	Ta V
	1171.4	Sb IV	20	1188.99	Ge IV	5000	1198.88	I II	50	1213.94	Tb IV
48	1171.71	Ga IV	150	1188.992	C I	20	1198.93	Cd IV	5	1214.14	Zn IV
120	1172.2	As III	20	1189.21	Sr IV		1199.1	Sb IV	1	1214.32	Be III
76	1172.51	Ta IV	50	1189.27	Lu IV	410	1199.550	N I	71	1214.36	Cu V
50	1173.67	Mo III	1000	1189.28	Br I	500	1200.07	Ru III	70	1214.66	Ta IV
10	1173.78	Ge III	80	1189.28	Ta IV	7000	1200.22	I II		1215.	Li II
2	1173.78	Ga II	250	1189.38	Br I	385	1200.223	N I	35	1215.09	He II
10	1174.34	Te II	150	1189.447	C I	70	1200.58	Tb IV	100	1215.10	Sn III
5	1174.37	Si III	1000	1189.50	Br I	360	1200.710	N I	50	1215.17	He II
6	1174.43	Si III	100	1189.62	Ge II	300	1200.76	Zr V	15	1215.38	Cd IV
370	1174.93	C III	200	1189.631	C I	50	1200.96	Cu III	85	1215.53	Ta IV
350	1175.26	C III	555	1189.87	As II	70	1201.0	S III	1000	1215.668	H I
85	1175.51	Ta IV	100	1189.92	Sn V	83	1201.22	Cu V	500	1215.674	H I
330	1175.59	C III	20	1189.95	Pb IV	900	1201.353	Cl I	750	1216.01	Br I
500	1175.71	C III	200	1189.99	Sn III	69	1201.54	Ga IV	10 h	1216.12	Si II
12	1175.79	Te II	100	1190.42	Si II	160	1201.76	Hf V	63	1216.15	Ga IV
5000	1175.84	I II	800	1190.51	Ru III	9000	1201.77	Zr IV	800	1218.10	As II
350	1175.99	C III	10000	1190.85	I II	50	1201.87	Ce III	100	1218.14	Sn III
100	1176.26	Sn V	5	1190.86	Ca III	15	1203.44	Zn IV	200	1218.41	I I
370	1176.37	C III	73	1190.89	Ga IV	10	1203.63	Pb II	11	1218.92	Ba III
230	1176.510	N I	300	1191.26	Ge II	20	1204.05	Ce III	80	1219.03	F III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
9	1219.07	Sn II	150	1228.75	Si II	20	1240.07	Lu IV	30	1253.67	Zn IV
300	1219.30	Cu III	160	1228.79	N I	600	1240.21	Al IV		1253.8	Li II
8	1219.40	Sc IV	70	1228.87	Cu IV	20	1240.40	Mg II	110	1253.8	S II
30	1219.80	Mn III	500	1228.89	I I	50	1240.80	Ag II	100	1253.99	La III
10000	1219.86	Zr IV	100	1228.97	Mn III	700	1240.86	Al IV	400	1254.01	V III
400	1220.55	Al IV	200	1229.39	Si II	10	1241.05	Bi II	100	1254.93	Mo III
80	1220.73	Ta IV	20	1229.81	Ge IV	760	1241.31	As II	20	1255.03	Ne III
15	1220.74	Lu IV	90	1229.83	Ne I	10	1241.67	Ti V	10	1255.28	Si I
20000	1220.89	I II	76	1230.11	Cu V	45	1241.81	Ga IV	2000	1255.63	La III
80	1220.96	Ta IV	110	1230.16	B II	90	1242.25	Mn IV	200	1255.64	Pr IV
9	1220.98	Te II	100	1230.17	Sn III	900	1242.804	N V	110	1255.68	Ne III
40	1221.07	Cr III	135	1230.21	Hf V	100	1242.98	Ta V	1000	1255.80	Br I
1000	1221.13	Br I	6	1230.30	Sb II	11	1243.00	Sn II	100	1256.00	Cd II
80	1221.22	Tb IV	50	1230.34	Mo III	965	1243.08	As II	40	1256.49	Si I
70	1221.34	Cu V	10	1230.36	Ti V	360	1243.179	N I	55	1256.81	Ag II
900	1221.87	Br I	500	1230.69	Pr IV	315	1243.306	N I	160	1257.19	Ne III
40	1221.90	Cr III	400	1230.90	La IV	500	1243.63	Sn III	95	1257.28	Mn IV
700	1222.30	Ge V	10	1231.20	Pb II	1200	1243.90	Br I	30	1257.31	Zn IV
9	1222.36	Ti V	100	1231.38	Sn III	30	1244.14	Sr IV	55	1257.55	Ag II
340	1223.15	As II	30	1231.46	Zn IV	200	1244.38	Cu III	900	1257.62	Al IV
1000	1223.24	Br I	7	1231.57	Tl III	160	1244.46	Hf V	20 p	1257.78	Sr IV
50	1223.33	Ag II	15	1231.73	Co V	90	1244.50	Mn IV	87	1258.34	Ta IV
20	1223.52	Cd IV	8	1231.81	Tl II	4	1244.66	I III	100	1258.52	Mo III
13	1223.70	Sn II	30	1231.88	Cr III	20 p	1244.75	Sr IV	800	1258.58	As II
90	1223.73	Ta IV	270	1232.03	Hf V	600	1244.76	Xe II	6	1258.61	Co V
20	1223.75	Lu IV	25	1232.1	Xe III	20 p	1244.87	S- IV	70	1258.69	Cu IV
20	1223.91	Si II	7500	1232.43	Br I	75	1245.53	Ga IV	83	1258.77	Ga IV
600	1224.05	I I	200	1232.57	Ru III	870	1245.67	As II	50	1258.80	Si I
600	1224.08	I I	15	1232.78	Bi II	5 r	1246.00	Tl II	100	1258.87	Nb V
20	1224.25	Si II	50	1232.96	Cr III	20	1246.06	Cd IV	40	1259.02	Cr III
25	1224.35	Zn IV	11	1233.50	Pb V	7	1246.13	Ti V	2500	1259.15	I I
1200	1224.41	Br I	200	1233.59	Hf V	3	1246.26	Zn IV	1500	1259.20	Br I
12	1224.55	Ba III	200	1233.91	Zr V	15	1246.56	Cd IV	8	1259.24	Hg I
20	1224.57	Au II	20000	1234.06	I II	100	1246.74	Si II	8	1259.242	Hg I
135	1224.62	Hf V	250	1234.07	Pr V	50	1246.87	Ag II	100	1259.25	Hf V
50	1224.64	Bi III	40	1234.1	S II	8	1246.91	Co V	1000	1259.40	Tb IV
10	1224.97	Si II	2	1234.55	Co V	79	1246.99	Cu V	110	1259.5	S II
175	1225.026	N I	50	1234.63	Mo III	15	1247.01	Zn IV	3000	1259.51	I I
160	1225.37	N I	220	1234.9	Se II	85	1247.73	Mn IV	100	1259.55	La III
10	1225.43	Bi II	500	1235.04	Tb IV	20	1248.10	Lu IV	8	1259.68	Zn IV
3	1225.45	Tl IV	7	1235.43	Si III	150	1248.43	Si II	200	1259.70	Zr V
50	1225.46	Mo III	650	1235.84	Kr I	10	1248.47	Pb V	1000	1259.92	Sn III
30	1225.65	Cr III	10	1235.92	Si II	6	1248.51	Mg II	50	1259.99	Cr V
12	1226.00	Sb V	30	1236.10	Mo III	700	1248.79	Al IV	70	1260.24	Cu V
3	1226.31	Co V	40	1236.20	Cr III	200	1249.35	Pr IV	1000	1260.42	Si II
300	1226.40	Pr IV	50	1236.23	Sr III	800	1249.59	Br I	75 p	1260.79	La IV
60	1226.52	V IV	60	1236.38	Ga IV	50	1249.69	Zn IV	400	1260.91	Zr V
50	1226.81	Si II	200	1236.54	La III	20	1249.82	P II	300	1261.12	La IV
20	1226.89	Si II	20	1236.95	Co V	8	1249.93	Mg II	800	1261.27	I I
1200	1226.90	Br I	500	1237.059	Ge II	15	1249.94	Cd IV	200	1261.27	Pr IV
40	1226.99	Si II	900	1237.19	Al IV	100	1250.048	Cu II	100	1261.552	C I
1	1227.13	Ga II	30	1237.26	Zn IV	100	1250.09	Si II	1200	1261.66	Br I
60	1227.44	Cu IV	160	1237.42	Hf V	250	1250.20	Xe I	40	1261.86	Cr III
450	1227.6	Se V		1238.	Li II	150	1250.43	Si II	500	1261.905	Ge II
100	1227.60	Si II	88	1238.12	Ta IV	40	1250.5	S II	100	1262.21	Mo III
20	1227.62	Zn IV	400	1238.19	Pr IV	80	1250.564	Hg I	30	1262.34	Cr III
135	1227.98	Hf V	40	1238.51	Cr III	80	1250.58	Hg I	10	1262.65	Ca III
50	1228.03	Ga IV	60	1238.59	Ga IV	4	1250.6	Pb III	5	1263.28	Co V
750	1228.05	Br I	1000	1238.821	N V	200	1251.16	Si II	100	1263.50	Cr V
8	1228.19	Co V	100	1238.85	Hf V	600	1251.34	I I	35	1263.61	Cr III
9	1228.20	Sc IV	300	1238.93	Zr V	2000	1251.38	Sn V	100	1263.74	Mo III
500	1228.37	Gd IV	50	1239.12	Zn IV	1500	1251.66	Br I	965	1263.77	As II
130	1228.41	N I	160	1239.53	Hf V	95	1251.93	Mn IV	800	1264.18	Al IV
10	1228.44	Si II	80	1239.73	Cu V	500	1252.11	V III	35	1264.21	Cr III
2000	1228.59	Pr IV	2	1239.85	Co V	8	1252.35	I III	90	1264.41	Mn IV
25	1228.62	Si II	25	1239.94	Mg II	50	1252.61	Cr III	81	1264.66	Ga IV
30	1228.65	Cr III	100 h	1239.96	Au III	65	1253.07	Cu V	100	1264.710	Ge II
40	1228.65	Zn IV	11	1239.96	Ti V	300	1253.61	Zr V	2000	1264.73	Si II
50	1228.7	Lu III	95	1240.06	Ta IV	9	1253.62	Te II	94	1264.91	Ta IV

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
200	1265.02	Si II	20	1276.54	Lu IV	3000	1289.74	Y III	275	1302.337	S I
10	1265.35	Bi II	30	1276.85	Ga V	200	1290.24	Yb IV	30	1302.39	Co II
500	1265.38	Zr V	20	1276.90	Co II	100	1290.49	Mo III	400	1302.80	Zr V
30	1265.45	Ga V	50	1277.01	Co V	500	1290.56	Zr IV	235	1302.863	S I
150	1265.506	Cu II	250	1277.216	S I	300	1290.77	V III	3000	1302.98	I I
500	1265.74	Zn IV	250	1277.245	C I	8	1290.82	Pb IV	235	1303.110	S I
20	1265.93	Co II	250	1277.282	C I	20	1290.86	Sn II	16	1303.32	Si III
1200	1266.20	Br I	60	1277.31	Zn II	300	1290.93	Pr IV	245	1303.430	S I
40	1266.27	Lu IV	200	1277.40	Mo III	285	1291.0	Se II	82	1303.53	Ga IV
10	1266.33	Tl III	300	1277.513	C I	10	1291.10	Pb IV	500	1303.93	Zr V
800	1266.34	As II	200	1277.53	Lu III	300	1291.62	Mn III	40	1304.36	Cd IV
30	1266.47	Cd IV	300	1277.550	C I	10	1291.62	Ti III	100	1304.37	Si II
50	1266.63	Ag II	200	1277.58	Mo III	70	1291.70	Zr IV	20	1304.47	P II
80	1266.87	F III	100	1278.06	Mo III	100	1291.83	Zn IV	3	1304.55	Tl IV
1	1266.9	Pb III	78	1278.20	Cu V	67	1292.08	Cu V	15	1304.68	P II
82	1267.15	Ga IV	11	1278.39	Ca III	1000	1292.30	Pr IV	200	1304.71	Pr IV
90	1267.16	Ga III	200	1278.40	Mo III	100	1292.49	Zn IV	600	1304.858	O I
12	1267.44	Fe II	100	1278.51	Au III	5000	1293.22	Pr IV	15	1305.24	Hf IV
8	1267.55	Pb IV	25	1278.51	Zn IV	10	1293.23	Ti III	40 h	1305.34	Au I
600	1267.57	I I	1000	1278.65	Pr IV	90	1293.46	Cu IV	35	1305.48	P II
800	1267.59	As II	100	1279.14	Cu III	80	1293.46	Ga III	50	1305.58	Mo III
600	1267.60	I I	81	1279.24	Ga IV	30	1293.97	Co II	600	1305.58	Yb IV
40	1267.60	Nb V	200	1279.34	Pr IV	60	1293.97	Na II	50 h	1305.59	Si II
90	1267.71	F III	1000	1279.48	Br I	10	1294.32	Zn IV	715	1305.70	As II
400	1268.32	Pr IV	200	1280.333	C I	200	1294.36	Sn V	260	1305.883	S I
8	1268.49	Ti V	6	1280.35	Si III	17	1294.54	Si III	1000	1305.97	Sn III
20	1268.62	Sr IV	100	1280.47	Zn IV	15	1294.70	Ti III	300	1306.029	O I
100	1268.82	Hg I	11 h	1280.70	Mg III	5000	1295.28	Pr IV	30	1306.07	Cd IV
100	1268.825	Hg I	715	1280.99	As II	60	1295.36	Ga III	8	1306.11	Ti V
5	1269.15	Zn IV	10	1281.55	Ca III	25	1295.53	Co II	10	1306.18	Bi II
77	1269.35	Cu V	30	1281.63	Co V	25	1295.55	Co V	8	1306.53	Te II
9	1270.52	Te II	150	1281.90	Mo III	1000	1295.59	Xe I	500	1306.66	Zn IV
300	1270.58	Pr IV	150	1282.455	Cu II	280	1295.653	S I	20	1306.69	Sb III
20	1270.70	Co V	6	1282.48	Ti III	300	1295.81	Zr V	11	1306.71	Mg II
275	1270.782	S I	150	1283.19	La IV	30	1295.86	Co II	20	1306.76	Co II
8	1271.24	Mg II	30	1283.41	Lu III	82	1295.86	Ga IV	400	1306.76	Zr V
40	1271.94	Co II	500	1283.58	Mn III	40	1295.87	Co V	300	1306.86	Pr IV
9	1271.94	Mg II	150	1283.60	Mo III	10	1295.88	Ti III	5	1306.93	I III
12	1272.00	Fe II	15	1283.64	Ga V	150	1296.43	Cd II	80	1306.95	Co II
100	1272.21	Zn IV	15	1283.73	Bi II	400	1296.50	Pr IV	2500	1306.96	Y III
20	1272.23	Co V	100	1283.81	Sn V	100	1296.62	Zn IV	220	1307.2	Se IV
100	1272.42	Lu IV	15	1284.00	Co V	14	1296.73	Si III	500	1307.23	Gd IV
98	1272.42	Ta IV	80	1285.33	Ga IV	100	1296.73	Zn IV	11	1307.40	Ba III
8	1272.72	Mg II	20	1285.63	Cd IV	20	1297.10	Co II	15 r	1307.50	Tl II
1000	1272.76	Al IV	500	1285.89	Zr IV	65	1297.51	Ag II	340	1307.74	As II
200	1272.98	Zn IV	68	1286.13	Cu V	70	1297.54	F III	5	1307.75	Hg I
20	1273.02	Lu IV	6	1286.23	Ti III	12	1298.04	Ca III	5	1307.751	Hg I
6	1273.03	Tl IV	1000	1286.26	Br I	200	1298.26	Pr IV	12	1307.88	Mg II
11	1273.43	Mg II	15	1286.36	Ti III	150	1298.395	Cu II	300	1307.93	Hg II
70	1273.67	Ag II	5	1286.38	Ga II	300	1298.54	Pr IV	50	1308.06	V IV
100	1274.37	Mo III	100	1286.42	Mo III	20	1298.66	Ti III	200	1308.08	Pr IV
15	1274.41	Cd IV	12	1286.52	Ca III	15	1298.89	Si III	12	1308.28	Mg II
7	1274.76	Te II	28	1286.95	Co V	18	1298.96	Si III	300	1308.297	Cu II
40	1274.77	Lu IV	40	1287.05	Cr III	20	1298.97	Ti III	300	1308.30	Tb IV
900	1274.82	Br IV	1000	1287.44	Pr IV	11	1299.18	Ba III	92	1308.51	Ta IV
10	1274.83	Mg III	150	1287.468	Cu II	73	1299.22	Cu V	12	1308.87	Ba III
90	1274.84	Cu IV	715	1287.54	As II	20	1299.46	Cd IV	285	1308.9	Se II
50	1274.94	Mo III	20	1287.58	Cd IV	83	1299.46	Ga IV	200	1309.27	Si II
8	1274.98	Sb II	400	1287.59	Mn III	80	1299.58	Co II	90	1309.41	Cu IV
1000	1275.10	Pr IV	500	1287.70	Al V	100	1299.82	Mo III	14	1309.44	Mg II
1500	1275.26	I I	500	1287.87	V III	10000	1300.34	I I	20 h	1309.46	Si II
200	1275.40	Pr IV	50	1288.07	Mo III	35	1301.12	Co V	80	1309.68	Ga IV
94	1275.48	Ta IV	50	1288.25	Mo III	14	1301.15	Si III	65	1309.72	Cu V
2	1275.52	Co V	12	1288.53	Ba III	300	1301.48	Tb IV	25	1309.87	P II
300	1275.572	Cu II	10	1289.30	Ti III	20	1301.87	P II	3000	1309.91	Br I
30	1275.78	Zn IV	50	1289.38	Lu IV	20	1301.88	Zn IV	60	1310.08	Lu IV
86	1275.94	Ta IV	3000	1289.40	I I	900	1302.168	O I	265	1310.194	S I
40	1276.31	Sn III	50	1289.41	Ce IV	100	1302.20	Sn V	8 r	1310.20	Tl II
100	1276.40	Mo III	400	1289.42	V III	2000	1302.31	La IV	25	1310.47	Au I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
290	1310.540	N I	200	1321.22	Zn IV	300	1332.97	Cu III	7	1345.20	Te II
60	1310.70	P II	300	1321.34	Fe V	760	1333.15	As II	300	1345.36	Yb IV
200	1310.71	Pr IV	5000	1321.36	Pr IV	100	1333.32	Zn IV	300	1345.61	Fe V
250	1310.95	N I	600	1321.42	Gd IV	1200	1333.53	La IV	50	1345.67	Co V
40	1311.12	Co II	300	1321.49	Fe V	5000	1333.57	Pr IV	58	1345.72	Ni IV
85	1311.20	Ag II	400	1321.71	Hg II	40	1333.59	F II	200	1346.05	Sn III
10	1311.35	Ga V	25 r	1321.71	Tl II	800	1333.79	Lu IV	60	1346.12	Bi III
85	1311.35	Ta IV	15	1321.85	Cd IV	12	1334.01	Ba III	15	1346.15	Cd IV
100	1311.363	C I	200	1322.33	Zn IV	4000	1334.04	Y III	800	1346.57	Mg IV
600	1311.70	Tb IV	100	1322.42	La III	150	1334.532	C II	70	1346.62	Ag II
40	1311.86	Co II	200	1322.43	Zn IV	200	1334.70	Sn III	300	1346.68	Mg IV
200	1312.39	Cu III	500	1322.51	Pr IV	500	1334.808	P III	100	1346.87	Si II
13	1312.59	Si III	50	1323.02	Lu IV	300	1334.94	Lu IV	77	1347.03	Ga IV
20	1313.05	Pb IV	60	1323.15	Ga III	3500	1334.96	La IV	1000	1347.07	Pr IV
300	1313.27	V III	4	1323.24	Ge III	500	1335.12	V III	10000	1347.240	Cl I
500	1313.29	Gd IV	400	1323.27	Fe V	11	1335.13	Ca III	45	1347.54	Na II
400	1313.35	V III	65	1323.28	Cu V	10	1335.20	Pb II	1000	1347.65	Sn III
250	1313.5	Br III	375	1323.515	S I	400	1335.20	Ni II	30	1347.90	Sr IV
55	1313.81	Ag II	6	1323.66	Tl IV	200	1335.705	P IV	200	1347.98	Zn IV
3000	1313.95	I I	500 p	1323.81	Zr V	300	1335.708	C II	10	1348.37	Pb II
300	1314.337	Cu II	60	1323.84	Ag II	3000	1335.726	Cl I	100	1348.54	Si II
285	1314.4	Se IV	8	1323.92	Pb IV	300	1335.96	Pr IV	100	1348.89	Au III
5000	1314.51	Y III	9	1323.951	C II	3	1336.26	Au II	10000	1349.18	La III
1000	1314.55	Sn IV	10	1324.92	Te II	7	1336.42	Te II	200	1349.90	Zn IV
60	1314.56	Nb III	81	1325.19	Ta IV	20000	1336.52	I II	150	1350.06	Si II
50	1314.61	Ag II	20	1325.46	Bi II	200	1336.72	Au III	20	1350.07	Bi II
80	1314.82	Ga IV	20	1325.55	Cd IV	7	1336.76	Na III	80	1350.07	Hg II
100	1314.84	Au III	500	1325.56	Tb IV	7	1337.10	Tl IV	20	1350.09	Au I
500	1314.96	Pr IV	200	1326.32	Yb IV	300	1337.34	Zr V	150	1350.18	Al II
700	1315.12	Tb IV	800	1326.36	Yb IV	7	1337.36	Na III	900	1350.26	Yb IV
200	1315.14	Zr V	500	1326.38	Pr IV	400	1337.90	Al IV	150	1350.32	Au III
300	1315.28	Pr IV	100	1326.395	Cu II	85	1338.09	Ga IV	100	1350.42	Cu IV
30	1315.42	Co II	100	1326.50	Cd II	50	1338.20	Lu IV	75	1350.46	Ta IV
87	1315.58	Ta IV	115	1326.57	N I	10 h	1338.37	Au I	400	1350.52	Al V
12	1315.72	Ba III	355	1326.643	S I	200	1338.612	O IV	20	1350.52	Si II
900	1316.04	Yb IV	200	1326.74	Zn IV	500	1339.29	Pr IV	150	1350.594	Cu II
30	1316.09	Co II	40	1326.84	Bi III	200	1339.48	Cu III	20	1350.66	Si II
1500	1316.10	Y III	40	1327.06	F II	100	1339.49	Lu IV	20	1350.84	Au I
355	1316.542	S I	1000	1327.34	Sn III	200	1340.06	Yb IV	76	1351.06	Ga IV
20	1316.59	Sn II	8	1327.40	Sb II	100 d	1340.08	Cu IV	6	1351.22	Co V
290	1316.618	S I	12	1327.59	Ti III	8	1340.67	Na III	5000	1351.657	Cl I
500	1316.71	Gd IV	1000	1327.67	Tb IV	1000	1340.74	Pr IV	200	1351.68	Lu IV
3000	1316.74	Br I	50	1327.74	Na II	30	1340.97	Cd IV	22	1351.74	Au I
15	1316.89	Cd IV	5	1327.81	Ga II	200	1341.32	Pr IV	250	1351.837	Cu II
300	1316.96	Pr IV	115	1327.92	N I	8	1341.47	Si III	600	1352.05	Mg IV
60	1317.0	Bi IV	50	1328.11	F II	965	1341.55	As II	50	1352.27	Zn IV
500	1317.22	Ni II	100 h	1328.37	Au I	180	1341.68	Au III	100	1352.64	Si II
1000	1317.37	Br I	10	1328.95	Ca III	24	1341.89	Ca II	30	1352.70	Pr III
3000	1317.54	I I	200	1329.11	Zn IV	60	1342.09	Ag II	1000	1352.76	La IV
2000	1317.70	Br I	64	1329.22	Cu V	300	1342.19	Mg IV	100	1352.81	Al III
11	1317.70	Ca III	20	1329.47	Bi II	7	1342.39	Si III	1000	1352.81	Pr IV
400	1317.86	Fe V	120	1329.578	C I	9 d	1342.39	Na III	5	1352.82	Al III
200	1318.00	Zn IV	120	1329.600	C I	12	1342.54	Ca II	25	1352.82	Au I
20	1318.19	Co II	5000	1330.04	La III	50	1342.57	Ag II	70	1352.86	Al III
300	1318.35	Fe V	400	1330.06	Al V	300	1342.58	Lu IV	15	1353.42	Co V
30	1318.60	Co II	2000	1330.19	I I	10	1342.73	Na III	200	1353.43	Yb IV
55	1318.89	Cu V	400	1330.40	Fe V	250	1342.78	Pr V	50	1353.54	Ag II
230	1319.00	N I	8 r	1330.40	Tl II	10 h	1342.80	Au I	100	1353.72	Si II
50	1319.15	Nb III	500	1330.79	Gd IV	130	1342.992	O IV	300	1353.74	Lu IV
315	1319.68	N I	15	1331.04	Lu IV	12	1343.06	Pb IV	70	1353.92	Ga III
20	1319.84	Co II	20	1331.13	Sr IV	86	1343.30	Ta IV	25	1354.14	Au I
500	1320.10	Pr IV	10	1331.65	Pb II	6	1343.39	Si III	100	1354.288	C I
300	1320.41	Fe V	400	1331.74	Hg II	230	1343.512	O IV	500	1354.35	Pr IV
100	1320.686	Cu II	100	1331.93	Lu III	50	1343.60	F II	5000	1354.66	Pr IV
1000	1320.70	Pr IV	500	1331.99	V III	40	1344.04	F II	11	1354.71	Ba III
200	1320.74	Zn IV	300	1332.06	Zr V	150	1344.08	Zn IV	30	1354.78	Cd IV
400	1320.74	Zr V	75	1332.16	Ce IV	300	1344.23	Pr IV	5000	1355.10	I I
30	1320.81	Zr III	4	1332.36	Tl III	650	1344.327	P III	80	1355.13	V IV
70	1321.17	Cu IV	92	1332.38	Ta IV	300	1344.845	P III	40	1355.20	Co V

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
300	1355.21	Zr V	74	1364.63	Ga IV	300	1374.12	Fe V	200	1384.41	Yb IV
11	1355.28	Na III	10	1364.74	Au II	5000	1374.41	Pr IV	900	1384.46	Mg IV
150	1355.305	Cu II	1000	1364.81	Pr IV	5	1374.62	Tl IV	12000	1384.60	Br I
150	1355.61	Au III	800	1365.20	Mn III	90	1374.69	Na II	8	1384.70	Sb II
30	1355.79	Au I	8	1365.26	Si III	120	1374.76	Ag III	250	1385.05	P V
150	1355.84	C I	500	1365.40	Au III	10	1374.80	Te II	50	1385.33	Au I
200	1355.85	Lu IV	14	1365.45	Mg II	70	1374.82	Au I	11	1385.43	Ca III
760	1355.93	As II		1365.54	Mg II	40	1375.05	Cr IV	710	1385.510	S I
500	1355.98	Zr V	300	1365.57	Fe V	1000	1375.07	As II	300	1385.68	Fe V
150	1356.13	Au III	2000	1365.77	Pr IV	25	1375.13	Zr III	500	1385.77	Mg IV
400	1356.15	Yb IV	92	1365.88	Ta IV	30	1375.20	Co V	300	1385.79	Au III
100	1356.20	Zn IV	300	1365.88	Yb IV	100	1375.33	Zn IV	200	1385.91	Pr IV
69	1357.07	Ni IV	60 d	1366.68	Zn II	15	1375.36	Lu IV	1000	1386.74	Sn III
12	1357.40	Hf IV	500	1366.695	P IV	400	1375.42	Yb IV	150	1387.371	N III
30	1357.67	Co V	8	1366.73	Te II	50	1375.76	Au I	800	1387.53	Mg IV
200	1357.82	Zn IV	7	1367.05	Si III	760	1375.78	As II	800	1387.94	Fe V
35	1357.86	Au I	200	1367.17	Au III	50	1375.98	Zn IV	5	1387.99	Si III
3000	1357.97	I I	15	1367.26	Mg II	15	1376.02	Bi II	960	1388.435	S I
6	1358.04	Sb II	20	1367.34	Lu IV	100	1376.02	Lu IV	500	1388.79	Al IV
20	1358.11	Cd IV	30	1367.39	Cr IV	500	1376.34	Fe V	100	1388.80	Cu IV
7	1358.56	Tl IV	100	1367.56	Tb IV	300	1376.46	Fe V	78	1388.80	Ta IV
300	1358.773	Cu II	15	1367.70	Mg II	400	1376.46	Tb IV	16	1388.94	Pb IV
200	1359.009	Cu II	2500	1367.71	I I	500	1376.54	Zr V	32	1389.11	Co V
400	1359.01	Fe V	400	1367.71	Tb IV	500	1376.62	Al IV	20	1389.14	Au I
20	1359.67	Lu IV	250	1367.951	Cu II	79	1376.62	Ta IV	640	1389.154	S I
70	1359.92	F III	25000	1368.04	La IV	300	1376.66	Yb IV	100	1389.41	Au III
10	1360.01	Ca III	40	1368.17	Zn IV	300 r	1376.79	Cu III	25000	1389.693	Cl I
40	1360.51	Au I	2500	1368.22	I I	20	1377.06	P I	15	1389.85	Lu IV
2000	1360.64	Pr IV	30	1368.24	Co V	350	1377.282	P IV	20	1389.92	Tb IV
1000	1360.72	Mn III	60	1368.62	Au I	200 r	1377.49	Cu III	20000	1389.957	Cl I
5000	1360.97	I I	400	1368.90	Pr IV	8000	1377.49	La IV	60	1390.07	Lu IV
3000	1361.11	I I	35	1368.98	Au I	200	1377.65	Zn IV	200	1390.30	Lu IV
20	1361.15	Sr IV	600	1369.20	Al V	180	1377.73	Au III	40	1390.39	Hf IV
200	1361.27	Hg II	4	1369.30	Co V	7	1377.75	Tl IV	50	1390.69	Lu IV
300	1361.28	Fe V	18	1369.42	Mg II	100	1377.82	Cu IV	3000	1390.75	I I
20	1361.32	Co V	400	1369.43	Mn III	20	1377.93	P I	50	1391.24	Zn IV
300	1361.39	Zr V	5	1369.44	Si III	25	1378.12	Co V	12	1391.27	Mg III
300	1361.45	Fe V	11	1369.53	Ba III	200	1378.23	Tb IV	180	1391.46	Au III
8	1361.60	Si III	200	1369.53	Zn IV	500	1378.56	Fe V	15	1392.10	Cd III
200	1361.75	Yb IV	700	1369.64	Tb IV	150	1378.69	Au III	50	1392.26	Ge II
600	1361.82	Fe V	200	1369.71	Sn III	30	1378.87	Au I	60	1392.27	Au I
12	1361.90	Na III	300	1369.72	Yb IV	30	1378.93	Zr III	40	1392.38	Lu IV
100	1362.05	Cu IV	965	1369.77	As II	10	1379.05	Co V	5000	1392.56	Ta V
80	1362.06	Au III	500	1370.14	Ni II	25	1379.40	P I	775	1392.588	S I
2	1362.25	Be III	50	1370.42	Zn IV	20000	1379.528	Cl I	2000	1392.90	I I
6	1362.33	Au II	60	1370.48	Cd IV	30	1379.56	Lu IV	80	1393.07	Zn IV
5	1362.37	Si III	150	1370.91	Cd II	8	1379.58	Sb III	100	1393.128	Cu II
220	1362.46	B II	10	1371.01	Co V	150	1379.62	P V	1100	1393.24	Gd IV
30	1362.46	Co V	12	1371.02	Fe II	600	1379.67	Al III	15	1393.39	Mg III
20	1362.47	Au I	640	1371.292	O V	150	1379.98	Au III	15	1393.76	Si IV
30	1362.55	Cd IV	300	1371.65	Mn III	10	1380.21	Co V	6	1393.80	Au II
200	1362.600	Cu II	200	1371.840	Cu II	100	1380.42	Ge II	20	1393.92	Bi II
150	1363.08	Cu III	100	1372.14	Cu IV	250	1380.463	P III	250	1393.93	Yb IV
300	1363.08	Fe V	11	1372.34	Na III	8	1380.53	Au II	300	1394.11	Pr IV
8	1363.15	Au II	25	1372.61	Bi II	125	1380.53	Au III	3000	1394.32	La IV
100	1363.24	Lu IV	400	1372.674	P IV	30	1380.98	Cd IV	50	1394.54	Zn IV
9	1363.24	Te II	75	1372.72	Ce IV	300	1381.00	Tb IV	800	1394.64	As II
400	1363.35	Al V	5	1373.03	Si III	150	1381.089	P III	60	1395.00	V IV
50	1363.37	Lu IV	30	1373.09	Co V	200	1381.36	Au III	6	1395.22	Te II
100	1363.43	Zn IV	2500	1373.116	Cl I	25	1381.47	P I	60	1395.54	Ga IV
12000	1363.447	Cl I	120	1373.22	Ag III	775	1381.552	S I	180	1396.00	Au III
7	1363.47	Si III	20	1373.49	P I	1000	1382.62	Pr IV	100	1396.00	Ag II
300	1363.64	Fe V	10 r	1373.52	Tl II	80	1382.75	Au I	1000	1396.112	S I
200	1363.95	Zn IV	20	1373.54	Lu IV	100	1382.83	Tb IV	12000	1396.527	Cl I
50	1363.98	Au I	700	1373.59	Fe V	15	1383.18	Lu IV	440	1396.66	Hf V
25	1364.15	Au I	800	1373.65	As II	4000	1383.23	I I	10	1396.78	Cd III
120	1364.164	C I	600	1373.67	Fe V	5	1383.60	Cd III	200	1396.79	Zr V
30	1364.17	Co V	300	1373.70	Al V	800	1384.13	Al III	6	1397.02	Pb IV
150	1364.50	Ag II	1000	1373.86	Tb IV	200	1384.23	Pr IV	500	1397.11	Pr IV

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
40	1397.18	Lu IV	300	1409.22	Fe V	10	1421.63	Ti III	67	1435.24	Ni IV
20	1397.65	Cd IV	20	1409.33	Co II	250	1421.759	Cu II	50	1435.26	Nb III
11	1397.69	Ca III	300	1409.337	S I	10	1421.77	Ti III	120	1435.3	Se I
400	1397.97	Fe V	1000	1409.36	Mg IV	160	1421.96	Hf V	10	1435.503	Hg I
76	1398.19	Ni IV	30	1409.40	Zn IV	12	1422.40	Ti III	10	1435.51	Hg I
100	1398.642	Cu II	600	1409.45	Fe V	220	1422.53	Hf V	5000	1435.56	Pr IV
350	1398.77	Yb IV	225	1409.50	Au III	5	1422.86	Be III	8	1435.77	Si III
91	1398.78	Ta IV	300	1410.03	Zr V	1	1423.2	Tl I	50	1435.79	Au I
1000	1399.31	Pr IV	20 h	1410.22	Si II	35	1423.33	Bi III	120	1435.8	Se I
2000	1400.01	I I	5	1410.33	Zn IV	150	1423.48	Cu III	250	1435.81	Au III
270	1400.09	Hf V	60	1410.44	Zn II	35	1423.52	Bi III	90	1436.09	Ne I
30	1400.14	Zn IV	500	1410.61	Sn III	200	1423.99	Yb IV	80	1436.12	Au III
600	1400.24	Fe V		1410.69	Au II		1424.	Li II	7	1436.17	Si III
18	1400.26	Pb IV	400	1410.90	Pr IV	10	1424.14	Ti III	150	1436.236	Cu II
800	1400.31	As II	100	1410.93	Ag II	1000	1424.36	Pr IV	8	1436.49	Sb II
25	1400.52	Sn II	8	1411.31	Ti V	9	1424.66	Sc IV	20	1436.61	Au II
50	1400.61	F II	74	1411.45	Ni IV	510	1425.030	S I	45	1436.83	Bi II
1000	1400.96	Pr IV	360	1411.94	N I	8000	1425.49	I I	300	1436.968	S I
200	1401.24	Ge II	270	1412.28	Hf V	12	1425.73	Fe IV	370	1437.27	Hf V
30	1401.32	Lu IV	5	1412.93	Tl IV		1426.12	Be I	50	1437.37	Mo III
100	1401.46	Lu IV	300	1413.14	Yb IV	500	1426.59	Pr IV	1000	1437.52	Sn IV
1	1401.52	Be III	93	1413.40	Ta IV	100	1426.65	V IV	500	1437.53	Mg IV
160	1401.70	Hf V	200	1413.40	Zr V	150	1427.42	Au III	1000	1437.64	Mg IV
70	1401.82	Cr IV	270	1413.51	Hf V	70	1427.45	Ni IV	500	1437.73	Hf V
50	1402.12	Au I	250	1413.80	Au III	50	1427.79	Zn IV	20	1438.58	Zn IV
800	1402.39	Fe V	120	1413.90	Ag III	200	1427.829	Cu II	70	1438.82	Ni IV
77	1402.55	Ga IV	100	1414.27	Au III	90	1428.58	Ne I	60	1439.09	Zn II
20	1402.619	Hg I	120	1414.29	Ag III	120	1428.61	Ag III	300	1439.12	Au III
20	1402.62	Hg I	50	1414.41	V IV	200	1428.87	Ni III	6	1439.52	Te II
12	1402.77	Si IV	200	1414.43	Hg II	300	1428.93	Au III	800	1440.53	Fe V
150	1402.777	Cu II	20	1414.44	Ga II	67	1428.93	Ni IV	200	1440.61	Yb IV
250	1402.9	Br III	5000	1414.58	La IV	200	1429.08	Lu IV	100	1440.62	Lu IV
100	1402.91	Au III	100	1414.898	Cu II	80	1429.19	Au I	500	1440.65	Zr IV
30	1403.08	In III	400	1415.20	Fe V	400	1429.38	Lu IV	2	1440.77	Be III
40	1403.48	Zr III		1415.22	Au II	10	1429.57	Sb III	300	1440.79	Fe V
30	1403.68	Cd IV	90	1415.27	Cu IV	150	1429.75	Br V	500	1441.06	Zr IV
15	1403.98	Zn IV	80	1415.54	Au III	15	1429.83	Cd IV	200	1441.21	Au III
	1404.12	Zn I	400	1416.15	Yb IV	250	1430.06	Au III	500	1441.470	Cl II
20	1404.18	Sb III	25	1416.28	Cd III	79	1430.11	Ta IV	83	1441.54	Ta IV
10	1404.34	Pb IV	11	1416.61	Ba III	50 d	1430.13	P I	7000	1441.63	La IV
8	1404.60	Tl IV	10 h	1416.97	Si JI	400	1430.243	Cu II	5	1441.73	Si III
300	1404.68	Mg IV	100	1417.09	Au III	300	1430.29	Yb IV	200	1441.76	Lu V
90	1404.68	Na II	13	1417.24	Si III	800	1430.57	Fe V	700	1441.82	Al IV
110	1404.93	Ag III	125	1417.39	Au III	10	1430.76	Sb I	150	1442.139	Cu II
	1405.12	Au II	100	1417.42	Cr IV	40	1430.80	Lu IV	400	1442.22	Fe V
70	1405.32	Ga IV	500	1417.70	Zr IV	10	1431.14	Mg III	400	1442.60	Br V
100	1405.4	Se I	400	1417.72	Yb IV	13	1431.43	Fe IV	40	1443.64	Lu V
90	1405.49	Cu IV	300	1418.12	Fe V	60	1431.92	Nb III	9	1444.10	Sc IV
135	1405.77	Hf V	90	1418.38	Ne I	600	1431.94	Al IV	10	1444.19	Na III
100	1406.4	Se I	250	1418.426	Cu II	100	1432.15	Zn III	100	1444.8	Se I
15	1406.58	Cd IV	60	1418.89	Cd IV	12	1432.50	Ca II	60	1445.04	Zn II
100	1406.6	Se I	69	1419.58	Ni IV	50	1432.50	Lu V	370	1445.40	Hf V
200	1406.64	Lu IV	80	1419.58	V IV	7000	1432.55	La IV	80	1445.43	Nb III
400	1406.67	Fe V	30	1419.60	Zn IV	95	1432.60	Ag II	400	1445.87	Al V
500	1406.82	Fe V	90	1419.72	Ag II	100	1432.77	Lu V	80	1445.98	Nb III
100	1407.00	Lu IV	50 w	1420.02	Lu V	5	1432.86	Cd III	200	1445.984	Cu II
250	1407.04	Lu IV	10	1420.04	Ti III	425	1433.280	S I	20	1446.08	Cd III
400	1407.05	Yb IV	35	1420.12	Zr III	275	1433.37	Au III	5000	1446.26	I I
40	1407.14	F II	5	1420.29	Cd III	60	1433.39	Nb III	150	1446.37	Au III
150	1407.169	Cu II	20	1420.32	Lu IV	370	1433.43	Hf V	800	1446.62	Fe V
370	1407.17	Hf V	10	1420.44	Ti III	6	1433.69	Si III	80	1446.69	Au III
400	1407.25	Fe V	600	1420.46	Fe V	20	1433.75	Ca II	100	1446.8	Se I
70	1407.38	Au I	8	1420.54	Cd III	10	1433.96	Pb II	100	1447.0	Se I
6	1407.83	Sb II	25	1420.87	Zr III	200	1434.31	Ni III	80	1447.09	Nb III
370	1408.38	Hf V		1420.89	Li II	90	1434.34	Cu IV	6	1447.20	Si III
100	1408.45	Au I	10	1420.89	Na III	6	1434.72	Tl IV	300	1447.42	Mg IV
25	1408.67	Sr IV	74	1421.22	Ni IV	30	1434.85	In III	50	1447.48	Nb IV
300	1409.03	Fe V	10	1421.26	Be III	250	1434.904	Cu II	800	1447.51	Al IV
10 h	1409.07	Si II	100	1421.59	Lu IV	1	1435.17	Be III	20	1447.54	Cd IV

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
25	1447.55	Cd III	250	1459.412	Cu II	5	1471.97	Cd III	100 h	1485.51	Si II
375	1447.83	P V	5000	1459.49	La III	400	1472.12	Lu V	200	1485.58	Lu V
25	1447.94	Bi II	300	1459.54	Mg IV	200	1472.395	Cu II	330	1485.622	S I
100	1448.14	Lu V	400	1459.62	Mg IV	69	1472.63	Ni IV	500	1485.88	Pr IV
100	1448.14	Lu IV	15	1459.77	Co V	30	1472.90	Co II	1000	1485.92	I I
300	1448.229	S I	12	1459.79	Ca III	425	1472.972	S I	3	1485.95	Ga II
250	1448.42	Au III	500	1459.83	Fe V	12	1473.20	Fe IV	25	1486.02	Co V
50	1448.50	Nb III	200	1459.95	Pr IV	80	1473.32	Au III	300	1486.05	Al V
500	1448.59	As II	200	1459.98	Zn IV	300	1473.41	Zn III	30	1486.50	Co II
700	1448.85	Fe V	300	1460.05	Zr V	40	1473.43	Nb IV	25	1486.55	Au II
73	1449.01	Ni IV	100	1460.11	Lu V	200	1473.71	Lu V	20 r	1486.57	Sb I
200	1449.058	Cu II	400	1460.73	Fe V	3	1473.73	Ga II	200	1486.72	Ba II
150	1449.2	Se I	60 h	1461.00	Bi III	250	1473.978	Cu II	50	1486.79	Nb III
12	1449.31	Na III	200	1461.76	Pr IV	550	1473.995	S I	700	1486.89	Al IV
40	1449.32	Lu V	11	1461.88	Ca III	300	1474.380	S I	300	1486.90	Zr V
3	1449.35	Pb II	25	1462.14	Bi II	15 h	1474.65	Si II	35	1486.93	Bi II
5	1449.37	Tl IV	7500	1462.15	La IV	100	1474.73	Au III	300	1487.15	Au III
5	1449.49	Ga II	500	1462.63	Fe V	1000	1474.91	Pr IV	390	1487.150	S I
90	1449.69	Cu IV	30	1462.65	Lu IV	200	1474.935	Cu II	40	1487.23	Nb IV
200	1449.77	Sn III	200	1463.336	C I	20	1475.15	Sn II	20	1487.70	In III
20	1449.83	Hf III	15	1463.34	Ca III	300	1475.60	Fe V	400	1487.788	P IV
3000	1449.90	Br I	20000	1463.47	La IV	600	1475.64	Al V	250	1487.91	Au III
400	1449.93	Fe V	2	1463.65	Ga II	40	1475.77	Lu V	50000	1488.45	Br I
250	1450.304	Cu II	200	1463.752	Cu II	30	1475.81	Co II	20	1488.73	Co V
100	1450.36	Lu V	400	1463.838	Cu II	20	1476.00	Mg II	750	1488.831	Cu II
100	1450.69	Lu V	10 h	1464.19	Sb I	150	1476.059	Cu II	300	1489.01	Ag III
200	1451.50	Ni III	100	1464.20	Zn III	100	1476.43	Zn IV	300	1489.098	P IV
60	1451.63	Nb III	92	1464.41	Ta IV	30	1476.65	Co V	9	1489.22	Sn II
18	1451.74	Ti IV	700	1464.68	Fe V	68	1476.82	Ni IV	100	1489.26	Zn III
76	1452.22	Ni IV	100	1464.72	Au III	160	1476.89	O III	200	1489.47	Au III
200	1452.294	Cu II	100	1464.72	Ag II	1600	1476.98	Gd IV	12	1489.53	Fe IV
200	1452.33	Lu IV	6	1465.25	Te II	60	1477.02	Zn II	67	1489.53	Ni IV
50	1452.38	Mo III	500	1465.38	Fe V	10	1477.14	Tl III	7	1489.56	Te II
20	1452.63	Cd IV	25	1465.44	Zr III	200	1477.32	Pr IV	8	1489.64	Sc IV
100	1452.64	Lu V	100	1465.75	Zn III	400	1477.92	Yb IV	8 r	1489.65	Tl I
120	1452.74	Ag III	2500	1465.83	I I	25	1478.01	Mg II	100	1489.71	Cr V
30	1452.89	P II	150	1465.86	Cr V	12	1478.85	Ba III	72	1489.83	Ni IV
13	1453.16	Ca III	73	1465.87	Ga IV	500	1479.47	Fe V	20	1490.11	V V
5000	1453.18	I I	15	1465.97	Cd IV	20	1480.89	Mg II	350	1490.45	Mg IV
200	1453.35	Lu V	200	1466.070	Cu II	150	1481.10	Au III	5	1490.50	Tl II
91	1454.32	Ta IV	8	1466.14	Cd III	300 r	1481.23	Cu III	100	1490.96	Zn III
100	1454.38	Lu V	80	1466.18	Cu IV	100	1481.25	Zn IV	300	1491.33	Zr V
250	1454.95	Au III	20	1466.21	Co II	400	1481.51	Mg IV	40 h	1491.36	Sb I
50	1455.11	Bi II	50	1466.23	Ag II	200	1481.544	Cu II	50	1491.36	P I
23	1455.19	Ti III	2000	1466.44	La III	50	1481.65	Cr V	300	1491.57	Yb IV
100	1455.21	Lu V	400	1466.65	Fe V	355	1481.665	S I	50	1491.67	Hf IV
300	1455.26	Al V	15	1466.67	Cd IV	100	1481.76	Au I		1491.76	Be I
30	1455.27	Cr III	20	1467.34	Ti IV	150	1481.764	C I	20	1491.79	Cd IV
70	1455.42	Ni IV	120	1467.402	C I	73	1482.25	Ni IV	15	1491.81	Cd III
300	1455.56	Fe V	7500	1467.54	La IV	25	1482.62	Co V	700	1492.625	N I
80	1455.65	Zn IV	40 c	1467.81	Lu V	50	1482.76	Cr V	490	1492.820	N I
30	1455.74	Cd III	10	1468.85	Au II	70	1482.77	Cu IV	300	1492.834	Cu II
700	1456.16	Fe V	35	1468.98	Co V	30	1482.90	Mg II	5000	1492.89	I I
120	1456.3	Se I	200	1468.99	Lu V	20	1482.91	Co V	3	1492.93	Li II
200	1456.41	Ag III	500	1469.00	Fe V	15	1482.95	Cd IV	5	1492.97	Li II
100	1456.68	Nb III	10	1469.17	Au II	485	1483.039	S I	40	1492.99	P I
200	1456.72	Zn III	12	1469.19	Ti IV	300	1483.233	S I	69	1493.01	Ni IV
50	1456.91	Zn II	10	1469.28	Au II	3	1483.52	Ga II	1	1493.04	Li II
5	1457.25	Si III	50	1469.45	Lu V	100	1483.79	Lu IV	60	1493.09	F II
5000	1457.39	I I	1000	1469.47	Zr IV	20	1484.26	Co II	50	1493.24	F II
5000	1457.47	I I	600	1469.61	Xe I	500	1484.507	P IV	200	1493.24	Lu IV
	1457.57	Zn I	93	1469.82	Ta IV	50	1484.67	Cr V	40	1493.31	F II
270	1457.91	Hf V	4	1470.34	In IV	80	1484.73	Nb III	250	1493.366	Cu II
600	1457.96	Al IV	150	1470.35	Br V	16	1484.87	Ca III	74	1493.67	Ni IV
10000	1457.98	I I	400	1470.697	Cu II	15	1484.87	Si II	20	1494.14	In III
300	1458.002	Cu II	100	1471.20	Lu V	90 h	1485.02	Si II	640	1494.675	N I
2500	1458.79	I I	150	1471.28	Au III	30	1485.05	Cr IV	800	1494.79	Al IV
100	1459.032	C I	100	1471.44	Ag III	30	1485.22	Si II	2	1494.89	Ge IV
4000	1459.15	I I	20	1471.87	Co II	200	1485.328	Cu II	90	1495.07	Ga III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
12	1495.18	Fe IV	300	1508.632	Cu II	100	1524.91	Nb III	500	1537.559	Cu II
3	1495.21	Ga II	100 h	1509.10	Si II	75	1525.31	Ni IV	100	1537.77	Lu IV
45	1495.21	Na II	20	1509.23	Co II	10	1525.32	Ge III	35	1538.06	Bi II
90	1495.25	Ta IV	50	1509.71	Nb III	70	1525.69	Ta IV	200	1538.091	Ge II
250	1495.430	Cu II	350	1510.506	Cu II	150	1525.764	Cu II	12	1538.29	Fe IV
300	1495.50	Mg IV	12	1510.68	Ba III	1000	1526.14	Al V	10 h	1538.63	Fe III
100	1495.94	Nb III	7	1510.76	Pb IV	2500	1526.45	I I	69	1538.93	Ni IV
40	1496.01	Na II	5	1511.01	Cd III	13	1526.60	Fe IV	500	1539.12	Al V
350	1496.687	Cu II	400	1511.26	Lu IV	500	1526.72	Si II	200	1539.30	Cl IV
12	1496.88	Ca III	10	1511.65	Cd III	200 h	1526.88	Pd III	800	1539.830	Al II
45	1497.73	Na II	50 h	1512.07	Si II	120	1527.04	Ag III	200	1540.239	Cu II
150	1497.97	Cr V	20	1512.30	Be II	2	1527.15	Ge III	80	1540.26	Au III
80	1498.02	Nb III	50	1512.34	Nb III	5000	1527.19	La IV	300	1540.389	Cu II
10	1498.70	Ti III	10	1512.42	Pb II	74	1527.68	Ni IV	300	1540.588	Cu II
68	1498.71	Ni IV	60	1512.43	Be II	74	1527.80	Ni IV	25000	1540.65	Br I
71	1498.77	Ni IV	200	1512.465	Cu II	15	1528.40	Cd III	150	1541.14	Ag III
200	1498.79	Zn III	50 r	1512.57	Sb I	500	1528.55	La III	750	1541.703	Cu II
72	1498.90	Ni IV	5	1512.62	In IV	500	1528.569	Cl II	100	1542.00	Au III
110	1498.93	F III	70	1512.74	Ni IV	35	1528.82	Hf IV	13	1542.16	Fe IV
	1499.2	Sb IV	70	1513.10	Na II	30	1529.30	Cd III	80	1542.25	Au III
10 r	1499.30	Tl II	5	1513.13	Cd III	100	1529.84	Zn IV	120	1542.29	P II
300	1499.42	Zn III	50	1513.25	Nb III	50	1530.10	Tb IV	100	1542.63	Pd III
80	1499.45	Nb III	200	1513.366	Cu II	20	1530.21	In III	14	1542.70	Fe IV
80	1499.81	Cu IV	30 p	1513.57	Si II	13	1530.26	Fe IV	500	1542.942	Cl II
67	1499.97	Ni IV	80	1513.81	Nb III	250	1530.4	Se I	75	1543.41	Ni IV
12	1500.24	Si III	95	1514.19	Ta IV	150	1531.3	Se I	200	1543.46	Cu III
250	1500.37	Au III	12	1514.22	Ba III	30000	1531.74	Br I	9	1543.86	Sc IV
300	1500.42	Zn III	200	1514.26	Cd II	200	1531.8	Se I	400	1544.677	Cu II
6	1500.61	Ge IV	500	1514.492	Cu II	500	1531.856	Cu II	50	1545.17	Cd III
150	1500.9	Se I	5	1514.57	Ga II	7	1532.03	In IV	200	1545.19	Cl IV
10	1501.19	Si III	5000	1514.68	I I	5	1532.10	Cd III	20	1545.29	Ca III
50	1501.53	Nb III	50	1514.76	Zn II	300	1532.131	Cu II	200 h	1545.95	Pd III
9	1501.87	Si III	8	1514.96	Sc IV	80	1532.51	P II	10000	1546.17	Zr IV
100	1501.99	Nb III	150	1515.08	Ag III	14	1532.63	Fe IV	74	1546.23	Ni IV
120	1502.01	F III	3	1515.19	Ga II	120 r	1532.74	Sb I	12	1546.40	Fe IV
350	1502.228	P III	90	1515.28	Cu IV	20	1532.82	Au I	120	1547.1	Se I
60	1502.30	Nb IV	100 r	1515.63	Ag I	20	1532.86	Au I	25	1547.57	Cd III
200	1502.47	Au III	300	1515.85	Zn III	100	1532.90	Sn IV	100	1547.958	Cu II
20	1502.50	Bi II	200	1516.17	Tb IV	13	1532.91	Fe IV	68	1548.04	Ni IV
500	1503.35	Pr IV	70	1516.66	Ni IV	30	1532.95	In III	1000	1548.202	C IV
150	1503.368	Cu II	400	1516.86	Pr IV	60	1532.98	Nb III	60	1548.43	P I
200	1503.74	Au III	60 p	1516.91	Si II	30	1533.09	Zn III	100	1548.50	Au III
400	1504.01	Ba II	200	1517.18	Pd III	40	1533.17	Bi II	50 r	1548.58	Ag I
110	1504.18	F III	50	1517.38	Nb III	1000	1533.45	Si II	8	1549.08	Y III
3	1504.41	Ga II	200	1517.631	Cu II	50	1533.68	Zn IV	200	1549.15	Cl IV
250	1504.663	P III	15000	1518.05	I I	15	1533.86	Fe IV	90	1549.336	N V
250	1504.757	Cu II	170	1519.03	Cr V	13	1533.95	Fe IV	30	1549.35	Lu IV
140	1504.79	F III	400	1519.07	Al IV	250	1533.986	Cu II	9	1549.55	Sc IV
3	1505.01	Ga II	500	1519.492	Cu II	50	1534.06	Nb IV	10	1550.07	Cd III
60	1505.03	Nb III	60	1519.63	Na II	50	1534.46	Ga III	200	1550.12	Zr V
10 h	1505.17	Fe III	600	1519.837	Cu II	76	1534.71	Ni IV	500	1550.19	Al IV
200	1505.388	Cu II	60	1520.14	V IV	50	1534.86	Mo III	12 h	1550.20	Fe III
100	1505.40	Pd III	200	1520.47	Zr V	250	1535.002	Cu II	20	1550.45	Cd III
12	1505.70	Sb V	200	1520.540	Cu II	80 r	1535.06	Sb I	300	1550.653	Cu II
300	1505.92	Zn III	40	1520.57	Bi II	90	1535.12	Cu IV	900	1550.774	C IV
6	1506.06	Si III	73	1520.63	Ni IV	8	1535.40	Ga II	15	1550.80	Sc IV
130	1506.30	F III	200	1520.71	Pr IV	14	1535.71	Pb IV	15	1550.89	Cd III
4	1506.37	Tl III	2000	1520.98	Pr IV	8	1535.76	Sc IV	150	1550.89	Ag III
80	1506.41	Na II	200	1521.06	Lu IV	120	1535.90	P II	80	1551.12	Cu IV
160 w	1506.72	O V	100	1522.21	Lu IV	5000	1536.17	La III	300	1551.389	Cu II
110	1506.77	F III	400	1523.46	Pr IV	5	1536.37	Ga II	20	1551.59	Lu IV
11	1506.88	Ca III	5	1523.50	In IV	80	1536.39	P II	5	1552.18	Cd III
60	1506.91	Na II	10	1523.55	Cd III	14	1536.58	Fe IV	300	1552.30	Zn III
5000	1507.04	I I	10000	1523.79	La III	30	1536.77	Bi II	12	1552.35	Fe IV
50 r	1507.37	Ag I	100	1524.23	Ag III	1	1536.91	Ga II	500	1552.646	Cu II
30	1507.82	Hf III	60	1524.36	Nb IV	300	1537.21	Cl IV	12	1552.71	Fe IV
10 r	1507.82	Tl II	12	1524.47	Sb V	73	1537.25	Ni IV	200	1552.94	Zn III
15000	1507.87	La IV	10	1524.78	In III	60	1537.50	Nb III	100	1553.02	F III
700	1508.37	Al V	200	1524.860	Cu II	800	1537.54	Al IV	130	1553.04	Ag III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
20	1553.1	Pb III	90	1567.35	Cu IV	500	1583.682	Cu II	20	1598.73	Cd IV
80	1553.11	Zn III	200	1567.54	Au III	11 d	1583.98	Na IV	80	1598.86	Nb III
20	1553.18	Ca II	14	1568.27	Fe IV	150	1584.10	Au III	10000	1598.95	Zr IV
500	1553.62	Pr IV	10 r	1568.57	Tl II	12	1584.14	Na IV	20	1599.30	Co II
15 p	1553.81	Y III	8	1568.92	In IV	800	1584.46	Al IV	80 r	1599.96	Sb I
250	1553.896	Cu II	15	1568.98	Cd III	40	1584.60	Cr III	7	16 9.47	Sn II
300	1554.22	Fe V	3	1569.33	In IV	8	1584.64	Sc IV	9	1600.09	Ge III
300	1554.38	Ba II	100	1569.385	Al II	82	1584.64	Ta IV	20	1600.42	Cd IV
80	1554.61	Au III	100	1569.416	Cu II	500	1585.10	Pr IV	70	1600.46	B I
32	1554.64	Ca II	500	1570.13	Pr IV	750	1585.11	La IV	12	1600.50	Fe IV
	1555.	Li II	12	1570.18	Fe IV	13	1586.13	Ca III	200	1600.51	Au III
400	1555.134	Cu II	50	1570.19	Nb III	12	1586.24	Mg III	13	1600.58	Fe IV
100	1555.16	Ag II	20	1570.20	Cd IV	50	1586.82	Nb III	120	1600.73	B I
15	1555.53	Ca III	1000	1570.36	Sn III	10 d	1586.99	Na IV	100	1600.87	Zn III
500	1555.703	Cu II	12	1570.42	Fe IV	12 d	1587.05	Na IV	10 h	1601.21	Fe III
8	1555.72	Sc IV	500	1570.99	As II	200	1587.16	Au I	12	1601.50	In IV
5	1556.48	Cd III	12	1571.24	Fe IV	130	1587.41	Ag III	25	1601.58	Bi II
1000	1557.25	Al IV	13	1571.27	Ca III	150	1587.5	Se I	40	1601.59	Cd III
69	1557.28	Ni IV	200	1571.58	Cd II	400	1589.28	Al IV	13	1601.67	Fe IV
110	1557.59	F III	80	1571.94	Au III	120	1589.28	Ag III	80	1601.92	V IV
500	1558.144	Cl II	25	1572.03	Hf IV	200	1589.56	Au III	12	1602.08	Fe IV
300	1558.345	Cu II	1	1572.62	Ce IV		1589.57	Zn I	400	1602.388	Cu II
8	1558.67	Tl III	16	1572.71	Mg III	80	1589.68	Au III	100	1602.486	Ge II
500	1558.88	As II	200	1572.73	Ba II	350	1589.87	Al V	180	1603.06	Sc III
500	1559.03	Al IV	200	1572.80	Pr IV	285	1590.01	O III	13	1603.18	Fe IV
500	1559.49	Pr IV	90	1572.99	Zn II	400	1590.165	Cu II	30	1603.19	Cr III
15	1560.18	Hf IV	40	1573.70	Bi II	100	1590.21	Nb III	150	1603.19	Cr V
67	1560.18	Ni IV	50	1573.87	Si I	20	1590.54	Co II	70	1603.60	Mn IV
120	1560.3	Se I		1573.92	Ba II	12	1590.62	Fe IV	13	1603.73	Fe IV
150	1560.310	C I	12	1574.55	Ba III	160	1591.33	O III	1000	1604.12	Rb II
15	1560.66	Cd III	5000	1574.55	Pr IV	13	1591.51	Fe IV	300	1604.54	Ni III
10	1560.66	Yb III	50	1574.82	Si I	170	1591.72	Cr V	80	1604.72	Nb III
400	1560.683	C I	30000	1574.84	Br I	60	1591.79	Bi II	200	1604.848	Cu II
400	1560.708	C I	200	1574.85	Au III	13	1592.05	Fe IV	20	1604.87	Cd III
200	1560.79	Zn III	10	1574.92	Sc IV	8	1592.23	Sc IV	13	1604.88	Fe IV
100	1561.341	C I	5000	1575.10	Pr IV	50	1592.41	Si I	1	1605.08	In IV
80	1561.42	Yb III	150	1575.3	Se I	30	1592.55	Lu IV	150	1605.26	Zr IV
400	1561.438	C I	2500	1575.92	La IV	20	1592.74	Sr IV	300	1605.281	Cu II
15 r	1561.58	Tl II	8	1576.11	Sb II	150	1593.2	Se I	13	1605.68	Fe IV
10	1562.04	Au II	20000	1576.39	Br I	7 r	1593.26	Tl II	700	1605.766	Al III
20	1562.06	Lu IV	500	1576.855	Ge II	12	1593.41	Au II	15	1605.97	Fe IV
80	1562.33	Au III	12	1577.20	Fe IV	150	1593.41	Au III	200 h	1606.10	Pd III
80	1562.41	Au III	150	1577.6	Se I	600	1593.556	Cu II	60 h	1606.40	Bi III
10	1562.45	Si II	2	1577.60	Ce IV	5000	1593.58	I I	250	1606.5	Se I
12	1562.46	Fe IV	12	1577.76	Fe IV	40	1593.59	Zr III	7	1606.59	In IV
18	1562.47	Ca III	150	1577.9	Se I	100 r	1593.60	As I	20	1606.64	Cd III
150	1562.55	Zn III	300	1577.90	Al V	500 r	1593.75	Cu III	400	1606.65	Al IV
15	1562.85	Si II	3000	1578.38	Pr IV	150	1594.55	Si I	400	1606.834	Cu II
11	1562.87	Na III	200	1579.44	Au III	84	1594.91	Ta IV	10	1606.98	Sb II
25	1563.24	Zr III	300	1579.492	Cu II	15	1594.92	Lu IV	13	1606.98	Fe IV
20	1563.67	Bi II	150	1579.5	Se I	50	1594.93	Si I	300	1607.11	Mg IV
100	1563.73	F III	220	1579.70	Cr V	80	1595.04	Cr IV	10	1607.28	Cd III
10	1563.77	Si II	200	1580.0	Se I	70	1595.12	Cu IV	85	1607.70	Ta IV
12	1563.79	Fe II	10	1580.50	Na IV	5000	1595.39	Tb IV	100 c	1607.72	Lu IV
9	1563.81	Sc IV	12	1580.62	Fe II	90 d	1595.59	Cr IV	5000	1607.95	Zr IV
700	1564.16	Al IV	300	1580.626	Cu II	20	1595.77	Co II	8	1607.99	Te II
500	1565.050	Cl II	75	1581.070	Ge II	125	1596.059	Al II	80 p	1608.14	Cu IV
10	1565.29	Na III	7	1581.36	Sb II	10	1596.29	Zr IV	10	1608.41	Te II
6	1565.51	Sb II	200	1581.53	Zn III	12	1596.67	Fe IV	18	1608.46	Fe II
100	1565.54	F III	400	1581.995	Cu II	12	1596.80	Ba III	250	1608.639	Cu II
12	1565.61	Ba III	900	1582.04	Al IV	300	1596.89	Pd III	15	1608.91	Cd III
100	1565.85	Th IV	100	1582.06	Zn III	300	1596.95	Mn III	17	1609.10	Fe IV
400	1565.924	Cu II	11	1582.18	Na IV	30	1597.95	Si I	500 h	1609.17	Mn III
82	1565.97	Ta IV	25000	1582.31	Br I	80	1598.00	Sc III	90	1609.50	Zr IV
5	1566.03	Cd III	10	1582.33	Na IV	13	1598.01	Fe IV	10	1609.61	Cd III
12	1566.12	Ba III	10	1582.39	Cd III	10	1598.18	Na III	40	1609.70	Bi II
13	1566.26	Fe IV	9	1583.41	Sc IV	70	1598.24	Au I	14	1609.83	Fe IV
400	1566.415	Cu II	80	1583.47	Cu IV	400	1598.402	Cu II	1	1610.1	Pb III
50	1566.92	Nb III	1500	1583.61	La IV	100	1598.52	Zn III	150	1610.19	Sc III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
150	1610.296	Cu II	100	1622.87	Si I	75000	1633.40	Br I	2	1648.00	In I
13	1610.47	Fe IV	100 w	1623.3	Sb I	500	1633.80	Mn III	3	1648.14	Ge IV
450	1610.50	P V	13	1623.38	Fe IV	50	1633.98	Si I	200	1649.194	Ge II
100	1610.7	Se I	100	1623.40	F III	13	1634.01	Fe IV	300	1649.38	Tb IV
12	1610.95	Ba III	13	1623.53	Fe IV	100	1634.46	Ag III	250	1649.458	Cu II
70	1611.10	Mn IV	160	1623.58	B II		1634.52	Mg I	60	1649.86	Ca II
12	1611.11	Au II	110	1623.77	B II	1	1634.61	Si IV	150	1649.94	Hg II
13	1611.20	Fe IV	300	1623.91	Mn III	300	1634.77	Pr IV	1000	1650.14	V III
100	1611.3	Se I	120	1623.95	Hg II	30	1635.14	Y III	20	1650.16	Cu IV
40	1611.38	Bi II	20	1624.0	S IV	18	1635.40	Fe II	1	1650.2	Tl I
100	1611.814	Al III	220	1624.02	B II	40	1635.68	Nb IV	100	1650.76	F III
800	1611.874	Al III	2 r	1624.130	Ge I	8	1635.75	Pb V	1	1651.16	Mg I
80	1611.88	V IV	70	1624.16	B II	3 r	1636.31	Ge I	50 h	1651.20	Sb I
100	1612.38	Zr III	160	1624.34	B II	15	1636.32	Fe II	60	1651.52	Ag I
15	1612.51	Cd III	100	1624.34	Au I		1636.48	Mg I	2	1651.528	Ge I
200 w	1612.8	Sb I		1625.22	Mg I	100	1636.605	Cu II	15	1651.58	Fe IV
300	1613.00	Pr IV	15	1625.27	Cd III	500	1636.82	Al IV	100	1651.74	Zn III
10	1613.15	Te II	100	1625.42	In III	750	1637.42	La IV	8	1651.80	In IV
13	1613.64	Fe IV		1625.50	Mg I	12	1638.07	Fe IV	20	1651.87	Cd III
400	1613.65	Pr IV	150	1625.627	Al II	12	1638.30	Fe IV	4 r	1651.955	Ge I
100	1613.79	Ag III	30	1625.71	Si I	50	1638.33	Zr III	32	1651.99	Ca II
10	1613.95	Na IV		1625.81	Mg I	60	1638.50	Cr V	50	1652.10	Ag I
15	1614.02	Fe IV		1626.16	Mg I	6	1638.82	Kr III	100	1652.24	Ag III
1000	1614.14	Mn III	120	1626.2	Se I	250	1638.88	Au III	250	1652.74	Au III
13	1614.64	Fe IV		1626.36	Mg I		1638.90	Mg I	20	1652.81	Bi II
13	1615.00	Fe IV	15	1626.47	Fe IV	6	1638.91	Te II	300	1652.87	Ni III
3 r	1615.57	Ge I		1626.56	Mg I	2	1638.96	Ge I	15	1652.90	Fe IV
12	1615.61	Fe IV		1626.79	Mg I	800	1639.06	Al IV	3	1653.08	Li II
12	1615.78	Ba III	14	1626.90	Fe IV	200	1639.33	Zn III	200	1653.12	Ni III
11	1615.92	Na IV		1627.02	Mg I	50	1639.40	Cr V	5	1653.13	Li II
5 h	1616.	Tl I		1627.27	Mg I	15	1639.40	Fe II	1	1653.21	Li II
200 l	1616.33	N V		1627.53	Mg I	14	1639.40	Fe IV	30 h	1653.35	Si I
	1616.65	Au II	600	1627.54	Al IV	80	1639.51	Nb III	13	1653.41	Fe IV
16	1616.68	Fe IV		1627.82	Mg I	4 r	1639.730	Ge I	400	1653.57	Mn III
250	1617.16	Au III		1628.12	Mg I	90	1639.75	Cu IV	130	1653.60	Ag III
200	1617.4	Se I	20	1628.25	Hg II	79	1639.82	Ta IV	50	1653.64	Hg II
5000	1617.60	I I		1628.46	Mg I	50	1639.90	Au I	100 h	1653.77	Ru III
14	1617.68	Fe IV	10	1628.48	In IV	16	1640.04	Fe IV	75	1653.83	Mn IV
60	1617.68	Zn II	25	1628.54	Cd III	14	1640.16	Fe IV	300	1654.43	Ag III
100	1617.78	Au III	13	1628.54	Fe IV	120	1640.34	He II	500	1654.46	Zr V
400	1617.81	Al IV		1628.80	Mg I	75	1640.43	Y III	400	1654.75	Tb IV
200	1617.915	Cu II	400	1629.12	Mn III	180	1640.47	He II	30 r	1655.32	Cu I
1000	1618.03	Pr IV	300 d	1629.13	Au III	2500	1640.78	I I	5	1655.4	Te I
12	1618.47	Fe II	15	1629.15	Fe II	15	1641.58	Ce IV	11	1655.47	Na IV
12	1618.57	Na IV	200	1629.19	Zn III	12	1641.76	Fe II	10	1655.62	In IV
150	1618.632	P III	20	1629.2	S IV	15	1641.87	Fe IV	25	1655.63	Cd III
200	1618.907	P III		1629.21	Mg I		1641.97	Mg I	13	1656.11	Fe IV
14	1619.02	Fe IV	300	1629.43	Si I	1000 r	1642.21	Cu III	250	1656.13	Ni III
130	1619.14	Ag III		1629.59	Mg I	20	1642.28	In III	700	1656.18	Ag III
15	1619.46	Hg II	200	1629.92	Si I	4	1642.80	Ca II	150	1656.266	C I
100	1619.61	Zn III	2 r	1630.173	Ge I	12	1642.88	Fe IV	200	1656.322	Cu II
350 l	1619.69	N V	13	1630.18	Fe IV	1000	1643.03	V III	70	1656.39	Mn IV
2000	1620.60	Mn III	250	1630.268	Cu II	150	1643.4	Se I	15	1656.65	Fe IV
50	1620.62	Zr III		1630.40	Ba II	315 w	1643.68	O V	120	1656.928	C I
12	1620.91	Fe IV		1630.52	Mg I	20	1643.77	Ca II	10	1656.99	Au II
13	1621.16	Fe IV	150	1630.84	Pd III	100	1644.17	Au III	300	1657.008	C I
150	1621.2	Se I	17	1631.08	Fe IV	100	1644.235	Al II	20	1657.04	Sb II
600	1621.426	Cu II	15	1631.12	Fe II	36	1644.44	Ca II	150	1657.10	Ag III
14	1621.57	Fe IV	75	1631.13	Si I	100	1644.50	Ag II	120	1657.380	C I
30	1621.66	Pt II	75	1631.31	Zr III	100	1644.809	Al II	12	1657.82	Fe IV
15	1621.68	Fe II		1631.62	Mg I	150	1644.82	Zn III	120	1657.907	C I
500	1621.93	Au III	50 c	1631.65	Lu IV	200	1644.96	Rb II	60	1657.92	Na II
2000	1622.30	Pr IV	84	1631.65	Ta IV	750 d	1645.21	La IV	100	1658.08	Cr IV
400	1622.428	Cu II	12	1632.08	Fe IV	1	1645.93	Mg I	150	1658.122	C I
150	1622.51	Zn III	14	1632.40	Fe IV	150	1646.67	Au I	60	1658.25	Zn II
100	1622.7	Se I	2	1632.53	Au II	15	1647.09	Fe IV	2	1658.31	Mg I
2	1622.83	Au II		1632.93	Mg I	12	1647.16	Fe II	12	1658.43	Fe IV
200	1622.86	Cl IV	500	1633.03	Zr V	250	1647.46	Mn III	70	1659.25	Mn IV
15	1622.87	Cd IV	2000	1633.19	Tb IV	2	1647.531	Ge I	200	1660.001	Cu II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
8	1660.05	Tl III	12	1673.86	Ca II	30	1690.28	Cr III	30	1702.86	Si I
14	1660.10	Fe IV	15	1673.89	Sb III	250	1690.7	Se I	40	1703.36	Zr III
500	1660.55	As II	125	1673.93	Au III	30 h	1690.79	Si I	1000	1703.51	Br IV
8	1660.71	Sc IV	50	1674.29	Sn III	100	1690.88	Cr IV	30 r	1703.84	Cu I
3	1661.345	Ge I	100	1674.51	Ba II	30	1691.08	Cu I	100	1704.33	Pd III
100	1661.49	Be I	230	1674.61	P I	100 r	1691.090	Ge I	70	1704.37	Cu IV
100	1661.54	Ag III	35	1675.06	Zr III	20 h	1691.5	Bi III	50	1704.43	Si I
12	1661.57	Fe IV	9	1675.15	Ti V	75	1691.68	Mn IV	50	1704.79	Tb IV
200	1661.79	Ni III	200	1675.20	Si I	8	1691.78	Ca II	12	1704.93	Fe IV
13	1662.32	Fe IV	250	1675.3	Se I	400	1691.95	Tb IV	1500	1705.03	Gd IV
13	1662.52	Fe IV	7	1675.48	Ar III	1000	1692.51	Ni III	20	1705.05	Tb IV
100 w	1662.6	Sb I	14	1675.66	Fe IV	60	1692.89	Cr III	200	1705.06	Ag III
300	1663.002	Cu II	35	1675.75	Zr III	75	1693.15	Mn IV	20	1705.16	Sr IV
100	1663.04	B I	400	1676.08	Pr IV	50	1693.29	Si I	100	1705.44	Nb III
4 r	1663.539	Ge I	150	1676.14	Ag III	20	1693.34	Co II	1600	1706.01	Gd IV
13	1663.54	Fe IV	1 h	1676.16	In I	500	1693.51	Ag III	8	1706.05	Co II
30	1664.52	Si I	84	1676.45	Ta IV	60 c	1693.67	Lu IV	50	1706.40	Pd III
75	1664.73	Mn IV	12	1676.78	Fe IV	1000	1693.94	Au III	60	1706.41	P I
250	1664.77	Au III	25	1677.03	Sr IV	100	1694.06	P I	80	1706.65	Zn III
1000	1664.84	La IV	12	1677.12	Fe IV	400	1694.37	Ba II	15	1707.06	Mg I
10 h	1665.275	Ge I	140	1677.40	F III	7	1694.38	Au II	15	1707.11	In IV
100	1665.76	Au I	12	1678.07	In IV	1000	1694.78	V III	100	1707.14	Nb III
10	1665.92	Sc IV	30	1678.15	Cd III	10	1695.23	Tb IV	40	1707.16	Cd III
50	1666.37	Si I	300	1679.14	Cu III	80	1695.40	Zn III	1000	1707.35	Co III
680	1666.688	S I	300	1679.19	V III	50	1695.51	Si I	200	1707.35	Ni III
150	1666.87	B I	30	1679.25	Cr III	5	1695.85	Ga II	150	1707.37	Th IV
80 b	1667.00	Mn IV	300	1679.71	P I	1000	1696.01	Co III	100	1707.40	Hg II
200	1667.29	B I	50	1679.73	Pd III	200	1696.20	Si I	80	1707.43	Cr III
1	1667.38	In IV	20	1680.05	Ca II	60	1696.64	Cr III	75	1707.43	Mn IV
400	1667.58	Tb IV	2	1680.13	Ca II	150	1697.09	Au III	200	1707.43	Ni III
100	1667.62	Si I	100	1680.20	V V		1697.16	Ba II	200	1707.52	Rb II
4	1667.802	Ge I	100	1681.07	Ag III	13	1697.28	Mg III	100	1707.53	Au III
300	1668.03	V III	13	1681.36	Fe IV	200	1697.94	Si I	40	1707.78	Cr III
13	1668.09	Fe IV	9	1681.40	Hg III	800	1697.99	Co III	500	1707.95	Co III
100	1668.11	Au III		1681.66	Li II	16	1698.18	Ca II	160	1707.996	O V
5	1668.43	Mg I	120	1681.68	Ne II	80	1698.30	Mn IV	5	1708.0	Te I
100	1668.52	Si I	12	1681.95	Fe IV	300	1698.36	Tb IV	10	1708.11	Ag I
100	1668.60	Cd II	400	1681.98	Tb IV	2	1698.65	Au II	150	1708.86	Ag III
84	1668.76	Ta IV	10	1682.15	Pb II	75	1698.70	Mn IV	50	1709.02	Lu V
30	1669.60	Yb III	70	1682.22	Th IV	400	1698.81	Mg IV	7000	1709.10	Ta V
12	1669.61	Fe IV	30	1682.68	Si I	50	1698.85	Sb I	50	1709.27	Ag I
7	1669.67	Ar III	100	1682.77	Nb III	15	1698.88	Fe IV	13	1709.81	Fe IV
3	1669.83	Ga II	120	1682.82	Ag II	200	1698.98	Au III	800	1709.90	Ni III
70	1670.08	Mn IV	500	1683.02	Mg IV	70	1699.06	Mn IV	250	1710.16	Au III
130	1670.39	F III	10	1683.41	Mg I	10	1699.29	Na III	3	1710.23	Sb III
3 r	1670.608	Ge I	50	1683.95	Hf III	200	1699.34	Au I	10 h	1710.83	Si II
5	1670.64	In IV	30	1684.01	Th IV	10	1699.70	Cd III	10	1711.12	Na III
300	1670.66	V III	750	1684.17	La IV	200	1699.84	Ru III	4	1711.23	Pb III
12	1670.74	Fe II	60	1684.40	Nb III	6	1700.0	Te I	20 h	1711.30	Si II
130	1670.75	Ag III	5	1684.46	Tb IV	200	1700.00	Au III	15	1711.41	Fe IV
50	1670.78	Yb III	20	1684.50	Lu IV	12	1700.40	Fe IV	12	1711.53	Ba III
1000	1670.787	Al II	100	1685.37	Tb IV	50	1700.42	Si I	5 h	1711.54	In I
14	1671.04	Fe IV	5	1685.40	Tl I	30	1700.63	Si I	15	1711.84	Sb III
70	1671.07	P I	120	1685.99	P I	30	1700.69	Au II	85	1712.16	Ta IV
250	1671.2	Se I	90	1686.07	Cr IV	60	1701.48	Cr III	14	1712.76	Fe IV
10	1671.53	Pb II	100	1686.250	Al II	6	1701.58	Te II	50	1713.25	Zn II
180	1671.68	P I	30	1686.82	Si I	30	1701.60	Tb IV	50 r	1713.36	Cu I
200	1672.41	Hg II	13	1687.09	Mg III	15 c	1701.97	Na IV	200	1713.53	Pr IV
90	1672.48	P I	8	1687.16	Ti V	4	1702.02	In IV	650	1715.30	Ni III
200	1672.55	Tb IV	640	1687.530	S I	12	1702.04	Fe II	200	1715.69	Au III
100	1672.59	Si I	15	1687.69	Fe IV	15000	1702.07	I I	60	1715.76	Zn II
120	1672.66	Cr IV	400	1687.90	Ni III	400	1702.10	Cu III	100 h	1715.97	Ru III
100	1672.776	Cu II	30	1688.09	Cu I	40	1702.13	F II	85	1716.13	Ta IV
12	1672.86	Fe IV	180	1688.36	Ne II	200	1702.25	Au III	100	1716.71	Au III
200	1673.05	Zn III	200	1688.49	Pr IV	10	1702.41	Na IV	50	1716.72	V V
7	1673.32	Si III	5	1688.5	Te I	50	1702.47	Cd II	200 r	1716.784	Ge I
7	1673.42	Ar III	100	1688.59	Zn III	20	1702.53	In III	600	1716.85	Rb II
25	1673.59	Au II	11	1688.94	Na III	100	1702.73	Hg II	80 r	1716.93	Sb I
13	1673.68	Fe IV	50 h	1689.29	Si I	500	1702.79	Co III	100	1716.99	F III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
12	1717.11	Fe IV	1	1728.	Tl I	50	1746.065	Ge I	35	1759.12	Zr III
100	1717.21	Hf IV	250	1728.14	Ag III	500	1746.10	Au III	5	1759.4	Te I
11	1717.40	Ti V	11	1728.27	Na III	8	1746.23	Sc IV	200	1759.49	Ru III
150 r	1717.45	Sb I	40	1728.90	Lu V	70	1746.88	Cr IV	200	1759.61	Lu IV
130	1717.68	Ag III	550	1729.08	Hf V	550	1747.01	Ni III	15	1759.75	Hg III
150	1717.721	Cu II	25	1729.53	Sr IV	75	1747.12	Zn II	8	1759.76	Ti V
300	1717.83	Au III	250	1729.945	N III	80	1747.13	Cr IV	75	1759.82	Mn IV
14	1717.90	Fe IV	10	1731.11	Na III	200	1747.34	Ag III	1000	1760.07	V III
14	1718.16	Fe IV	750	1731.83	Hf V	60	1747.39	F II	350	1760.104	Al II
12	1718.42	Fe IV	100	1732.04	Cr IV	50	1747.40	Si I	220	1760.12	O III
1000	1718.55	N IV	20	1732.12	Sr IV	12	1747.56	Mg III	5000	1760.35	Co III
20	1718.57	Hf IV	250	1732.14	Hg II	12	1747.65	In IV	110	1760.42	O III
65	1718.67	Mn IV	30	1732.70	Mn II	40	1747.67	Cd III	5000	1760.50	Rb II
270	1719.32	Hf V	500	1732.86	Pr IV	20	1747.80	Mg I	50	1760.57	Mo III
20	1719.43	Ce III	250	1733.13	Ni III	570	1747.848	N III	100	1760.57	Ag III
800	1719.440	Al II	100 d	1733.17	Au III	10	1748.10	In IV	500	1760.89	Hf V
14	1719.46	Fe IV	50	1733.55	Mn II	15	1748.15	Cd III	13	1761.08	Fe IV
500	1719.46	Ni III	750	1733.96	Hf V	500	1748.28	Ni II	12	1761.38	Fe II
50	1719.82	Yb III	40	1733.98	Cr IV	100	1748.83	In III		1761.75	Ba II
200	1719.86	Pd III	80	1734.16	Cr IV	18	1748.93	Mg III	500	1761.95	Au III
10	1720.04	Au II	40	1734.49	Mn II	1000	1749.11	Hf V	300	1761.975	Al II
75 b	1720.52	Mn IV	40	1734.84	Mg II	20	1749.29	Bi II	70	1762.17	Mn IV
75	1720.74	Mn IV	80 d	1735.61	Zn II	80	1749.63	Zn III	80 c	1762.19	Zn II
500	1721.244	Al II	100 c	1735.79	Lu IV	120	1749.64	Ag III	10	1762.26	Ca III
200	1721.26	Ni III	100 r	1736.19	Sb I	10	1749.80	Au II	12	1762.30	Sb III
900	1721.271	Al II	2000	1736.24	Gd IV	200	1750.043	Ge I	150	1762.62	Ag III
75	1721.41	Mn IV	8	1736.43	Sb II	1000	1750.19	Hf V	70	1762.80	Yb III
400 c	1721.42	Lu IV	125	1736.44	Ag II	40	1750.65	Mg II	45	1762.81	Cr III
7	1721.89	In IV	100	1736.551	Cu II	150	1750.89	Ag III	300	1762.86	Pr IV
10	1721.93	Cd III	100	1736.78	Lu IV	6	1751.0	Te I	75	1762.94	Mn IV
400	1721.98	V III	60	1736.89	Zn II	750	1751.03	Ag III	290	1763.00	Al I
10	1722.04	Mg III	10 r	1737.21	Sn I	350	1751.218	N III	79	1763.03	Ta IV
200	1722.27	Ag III	50	1737.62	Mg II	50	1751.22	Mo III	220	1763.22	O III
400	1722.28	Ni III	50	1737.90	Zn II	15 r	1751.46	Sn I	50	1763.66	Si I
500	1722.37	Cu III	30	1737.93	Mn II	85	1751.59	Mn IV	60	1763.72	Nb III
6	1722.53	Si IV	500	1738.25	Ni III	650	1751.657	N III	500	1763.869	Al II
14	1722.71	Fe IV	300	1738.48	Au III	500 d	1751.68	V III	700	1763.952	Al II
65	1722.94	Mn IV	22	1738.84	Mg III	30	1751.70	Pt II	100 h	1764.185	Ge I
40	1722.95	Cd III	25	1739.00	Cd III	500	1751.823	C I	220	1764.48	O III
10	1723.01	Co II	100 h	1739.102	Ge I	300	1752.43	Ni III	800	1764.69	Ni III
30	1723.13	Pt II	60	1739.18	Yb III	40 c	1752.60	Lu IV	30	1764.75	Zr III
150 r	1723.43	Sb I	50	1739.19	Cr IV	400	1753.01	Ni III	12	1764.92	Fe IV
500	1723.97	Co III	50	1739.30	Nb III	30 h	1753.11	Si I	20 r	1764.98	Sn I
14	1724.06	Fe IV	300	1739.78	Ni III	150	1753.281	Cu II	40	1765.03	Si I
20	1724.23	Sr IV	2	1740.00	Pb I	10 h	1753.3	Sn I	400	1765.03	Yb IV
12	1724.26	Fe IV	20	1740.16	Mn II	50	1753.46	Mg II	80 h	1765.21	Yb III
50	1724.41	Cd II	45	1740.52	Au II	50	1753.84	Zn III	100 h	1765.284	Ge I
300	1724.63	V III	15 h	1740.55	Co II	82	1753.90	Ta IV	30 h	1765.60	Si I
75	1724.83	Mn IV	2 h	1741.23	In I	8	1754.21	Co II	370	1765.62	Hf V
500	1724.952	Al II	600	1741.37	Cu III	40	1754.38	Zr III	450	1765.64	Al I
900	1724.984	Al II	1000	1741.55	Ni II	2 h	1754.69	Be III	100 h	1765.76	Sb I
15	1724.99	V V	50 r	1741.57	Cu I		1755.33	Li II	300	1765.815	Al II
3	1725.0	K II	500	1741.62	Pd III	10	1755.48	Na III	30	1766.06	Si I
700	1725.02	Zr V	440	1741.74	Hf V	110	1755.64	Cr IV	10 h	1766.14	Ag I
40	1725.03	Zr III	100	1741.74	Lu IV	500	1755.98	Co III	85 d	1766.27	Mn IV
100	1725.14	Lu IV	300	1741.96	Ni III	35	1756.15	Au II	450	1766.38	Al I
80	1725.26	Cr IV	20	1742.00	Mn II	50	1756.91	Hf III	50 h	1766.433	Ge I
15	1725.33	Sb III	85 b	1742.10	Mn IV	500	1756.92	Au III	2	1766.64	Pb I
16	1725.63	Fe IV	100	1742.195	Ge I	500	1757.73	V III	1000	1766.88	Pr IV
30	1725.66	Cd III	775	1742.729	N I	50	1757.79	Sb I	30	1766.92	Cr III
50 r	1725.66	Cu I	15	1743.39	Co II	7	1758.00	Sn II	75	1767.09	Mn IV
25	1725.75	Au II	50 c	1743.84	Lu IV	400	1758.19	Pd III	12	1767.36	Fe IV
20	1726.47	Mn II	30 h	1743.88	Si I	100	1758.279	Ge I	300	1767.42	Au III
20	1726.75	Pb II	150	1744.39	Au III	100	1758.33	Nb V	2000 p	1767.65	La IV
150	1726.76	Ag III	40	1744.75	F II	1 h	1758.49	In I	100	1767.69	Zn III
90	1727.07	Cr IV	700	1745.252	N I	120	1758.51	Cr IV	400	1767.731	Al II
120	1727.18	Hg II	50	1745.55	F II	100	1758.60	As I	750	1767.78	O III
500	1727.31	Au III	400	1745.67	Co III	50	1758.63	Nb III	2	1767.88	In III
5	1727.38	Si IV	5	1745.69	Cd III	82	1759.04	Ta IV	500	1767.94	Ni III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
550	1768.24	O III	100	1779.51	Zr III	500	1791.28	Co III	2	1802.87	Pb V
100	1768.43	Rh III	500	1779.72	V III	200	1791.64	Ni III	110	1803.03	F III
150	1768.70	Ag III	70	1779.74	Yb III	160	1791.65	F III	200	1803.47	Rb II
10	1768.77	In IV	200	1779.80	Y III	100	1791.70	Ag III	30	1803.89	Hg II
30	1768.82	Cd III	2000	1780.05	Co III	70	1791.93	Bi II	400	1804.06	Mn III
200	1768.86	Cu III	100	1780.57	Au III	13	1792.10	Fe IV	500	1804.13	V III
450	1769.14	Al I	100 r	1780.87	Sb I	135	1792.39	Hf V	150	1804.486	N III
30	1769.17	Cr III	160	1781.03	O III	150	1792.65	Au III	80 r	1804.60	Sn I
100	1769.64	Cr IV	70	1781.31	Yb III	100	1792.69	Ag III	100	1804.70	F III
2000	1769.64	Ni III	30	1781.86	Pt II	10 r	1792.76	Tl II	400	1804.91	Pd III
500	1769.96	Co III	75	1782.21	Mn IV	25	1792.99	V V	400	1805.24	Au III
120	1770.09	F III	200	1782.45	Lu IV	100 h	1793.071	Ge I	100	1805.26	Zr III
30	1770.63	Si I	4000	1782.55	Pd III	250	1793.3	Se I	12	1805.32	Fe IV
150	1770.67	F III	12000	1782.76	I I	35	1793.31	Au II	500	1805.54	Co III
100 h	1770.92	Si I	200	1782.87	P I	12	1793.38	In IV	200	1805.669	N III
	1771.03	Ba II	3000	1782.97	Co III	75	1793.40	Cd III	170	1805.90	F III
1000	1771.14	Pr IV	60	1783.04	Na II	150	1793.56	Zr III	500	1806.09	Zr V
7	1771.45	Ti V	60	1783.22	Au II	20	1793.70	Yb III	170	1806.15	As I
360	1771.67	O III	50 h	1783.23	Si I	500	1793.76	Au III	80	1806.18	V IV
100	1771.81	Ag III	20	1783.25	Mg III	500	1793.82	V III	300	1806.47	Mn III
30	1771.96	Zr III	40	1783.35	Zr III	60 c	1793.85	Lu V	15	1807.07	Na III
300	1772.08	Lu IV	40	1783.70	Hg II	150	1793.90	Ag III	90	1807.09	Na II
65	1772.11	Mn IV	100	1783.85	Ag III	10	1794.22	Ca III	300	1807.24	Ni III
600	1772.57	Lu IV	10	1783.93	Ca III	i4	1794.58	Mg III	710	1807.311	S I
110	1772.93	F III	500	1784.06	Co III	1000	1794.60	V III	20	1807.34	Ca II
15	1772.98	Mg III	150	1784.24	Rh III	2	1794.67	Pb I	50	1807.60	Mo III
110	1773.00	O III	400	1784.44	V III	200	1794.90	Ni III	13	1807.89	Ca III
12	1773.01	In IV	40 c	1784.71	Lu V	300	1795.3	Se I	150	1808.00	Si II
40	1773.06	Cd III	160	1784.85	O III	80	1795.65	Mn IV	20 d	1808.01	Co II
500	1773.22	Co III	200	1784.94	Rh III	6	1795.7	Te I	300	1808.23	Ag III
140	1773.36	F III	200	1785.046	Ge I	80	1795.79	Mn IV	40	1808.29	Hg II
20	1773.40	Sn I	20	1785.26	Fe II	15	1796.10	Cd III	60	1808.38	Na II
300	1773.43	V III	100	1785.84	Cd II	30	1796.22	Hg II	4000	1808.66	La IV
75	1773.51	Mn IV	75	1786.02	Mn IV	6	1796.3	Te I	50	1808.70	Nb III
5000	1773.57	Co III	600	1786.05	Y III	150	1796.50	Rh III	50 h	1809.09	Si I
110	1773.85	O III	300	1786.11	Au III	10	1796.670	Pb II	250	1809.63	Yb IV
40	1773.90	Zr III	500	1786.20	Zr V	300	1796.77	V III	500	1809.68	Rb II
270	1774.02	Hf V	100 c	1786.25	Lu V	20	1796.89	Ce III	60	1809.73	Lu V
75	1774.04	Zn II	20	1786.74	Fe II	200	1796.90	Hg II	100	1809.81	Au III
200	1774.176	Ge I		1786.93	Ba II	13	1796.93	Fe IV	60	1809.85	V IV
500	1774.42	Co III	75	1787.04	Mn IV	100	1797.52	Lu IV	50 r	1810.50	Sb I
100	1774.42	Au III	1000	1787.08	Co III	100	1797.64	Zn II	1	1810.71	In III
200 r	1774.82	Cu I	80	1787.19	Na II	30	1797.99	Cu IV	10	1810.77	Na III
250	1774.99	P I	75	1787.38	Mn IV	500	1798.06	Co III	65	1810.88	Yb III
5	1775.0	Te I	60	1787.47	Bi II	125	1798.13	Zr III	300	1811.02	Mn III
800	1775.17	Au III	60 c	1787.58	Lu V	500	1798.15	V III	100 d	1811.05	Zn II
65	1775.29	Yb III	180	1787.68	P I	8	1798.39	Pb IV	15	1811.34	Sn II
20	1775.30	Ce IV	18	1788.07	Fe II	80	1798.41	Na II	30	1811.42	V V
20	1775.68	Hg I	100 r	1788.24	Sb I	60	1798.74	Hg II	400	1811.47	Co III
50 c	1775.92	Lu V	1000	1788.26	V III	60	1798.85	Yb III	11	1811.67	Na III
400	1776.07	Ni III	200	1788.30	Ni III	5000	1799.09	I I	200	1811.69	Ni III
15	1776.12	Be II	75	1788.64	Mn IV	100 h	1799.12	Si I	500	1811.71	Sn III
200	1776.18	Yb IV	45	1788.85	Na II	5	1799.42	Ga II	14	1812.15	Ca III
20	1776.34	Be II	1000	1789.07	Co III	75	1800.03	Zr III	1000	1812.19	V III
200	1776.40	Au III	8	1789.15	In IV	150	1800.18	Sb I	130	1812.41	Cr IV
90	1776.57	Na II	30	1789.19	Cd III	12	1800.21	Ca III	5	1812.97	Pb I
100 h	1776.83	Si I	220	1789.66	O III	5	1800.57	Cd III	30	1813.04	Sn I
50 r	1777.09	Pt II	300	1789.71	Yb IV	35	1800.58	Au II	600	1813.47	Gd III
80	1777.11	Bi II	200	1790.19	Zr III	15	1800.66	Mg III	11	1813.59	Ca III
1000	1777.14	Co III	500	1790.26	Co III	45	1801.26	Na II	600	1813.84	Yb IV
20	1777.25	Sr IV	75	1790.37	Ag II	75 h	1801.432	Ge I	10	1813.98	Ga II
40 c	1777.68	Lu V	250	1790.40	Ni III	200	1801.67	Yb IV	500 h	1814.07	Si I
100	1777.82	Cr IV	75	1790.44	Mn IV	25	1801.67	Zr III	80 r	1814.20	Sb I
400	1778.02	V III	30 r	1790.75	Sn I	200	1801.98	Au III	60	1814.24	Lu V
200	1778.20	Yb IV	80	1790.76	Zn II	150	1802.24	Ag III	40	1814.50	Ca II
40	1778.24	Na II	200 p	1790.81	Zr V	150	1802.26	Ag III	4	1814.65	Ca II
20	1779.03	Ce IV	200	1790.93	Ni III	300	1802.55	V III	12 r	1814.85	Tl II
220	1779.16	O III	800	1791.06	Yb IV	140	1802.72	Cr IV	1500	1815.32	Gd IV
200	1779.34	Yb IV	40	1791.09	Cr IV	100	1802.77	Ag III	40 r	1815.74	Sn I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
200	1816.03	Rh III	400	1831.64	V III	70	1845.02	Na II	6	1853.8	Te I
400	1816.07	Yb IV	9	1831.89	Sn II	300	1845.07	V III	800	1854.15	Ni III
80	1816.48	Zn II	35	1831.89	Zr III	15	1845.30	Ga II	400	1854.39	Co III
10	1816.81	Na III	750	1831.92	Co III	300	1845.51	Si I	500	1854.42	V III
250	1816.83	Ag III	1000	1832.05	Rh III	100 h	1845.872	Ge I	1000	1854.57	Lu III
200	1816.92	Si II	400	1832.20	Co III	100	1846.10	Si I	1000	1854.716	Al III
10	1817.45	Si II	250	1832.33	Ag III	500	1846.16	Co III	100	1854.73	Mo III
70	1817.56	Cu IV	120	1832.50	Ag III	500	1846.37	Zr IV	400	1854.76	Co III
250	1817.58	Yb IV	5	1832.74	Hg I	150	1846.42	N III	90	1854.80	Yb III
100	1817.68	V IV	400	1832.837	Al II	100 h	1846.958	Ge I	2400	1855.05	Co I
150	1817.86	B I	100 d	1833.57	Zn II	100	1846.96	Ag III	300	1855.06	V III
35	1818.06	Zr IV	45	1833.87	Na II	3 h	1847.	Tl I	300	1855.2	Se I
200	1818.37	B I	100	1834.31	Ag III	100	1847.19	P I	9	1855.84	In IV
1000	1818.56	Al IV	20	1834.32	Bi III	650	1847.28	Ni III	40	1855.85	Cd III
300	1819.02	Yb IV	250	1834.808	Al II	30	1847.30	Yb III	10	1855.92	Na III
60	1819.23	Cr IV	5000	1835.00	Co III	400	1847.47	Si I	300	1855.929	Al II
70	1819.23	Cu IV	80	1835.22	Na II	12 d	1847.53	Na III	150	1856.33	Ag III
300	1819.28	Ni III	10 d	1835.22	Na III	75	1847.56	Zn II	110	1856.62	O III
25	1819.31	Sn I	70	1836.01	Zn II	10 d	1847.59	Na III	15	1856.64	In IV
20	1819.50	Mo IV	250	1836.10	Ag III	20	1847.71	Ag I	500	1856.64	V III
400	1820.34	Hg II	500	1836.15	Zr IV	1800	1847.89	Co I	200	1856.67	Cd III
680	1820.343	S I	200	1836.51	Si I	200	1848.03	Zr IV	10	1856.71	Na III
12	1820.42	Fe IV	75	1836.65	Zn II	200	1848.14	Si I	80	1857.16	Yb III
400	1821.17	Au III	20	1836.66	Ce III	110	1848.26	O III	8	1857.2	Te I
400	1821.26	Co III	20	1836.99	Ce III	100	1848.74	Si I	500	1857.488	Cl II
30	1821.59	Mo IV	60	1837.04	Cu IV	50 r	1848.75	Sn I	20	1857.92	Mn II
400	1821.69	Co III	200	1837.44	Cr V	150	1848.83	Au III	700	1858.026	Al II
50	1821.70	Na II	10	1837.56	Co II	30	1849.24	Yb III	13	1858.19	Mg III
400	1821.77	Co III	1000	1837.63	Co III	10	1849.42	Yb III	300	1858.75	Ni III
10	1822.050	Pb II	45	1837.89	Na II	1000	1849.492	Hg I	250	1858.8	Se I
10	1822.4	Te I	40	1838.01	Ca II	1000	1849.50	Hg I	60	1858.89	Sb I
150	1822.45	Ag III	30 h	1838.01	Si I	15	1849.56	Na III	150	1858.91	P I
50	1822.45	Si I	30	1838.01	Yb III	80	1849.62	Cu IV	120	1858.91	Ag III
600	1822.50	Cl III	150	1838.64	Ag III	120	1849.93	Ag III	30	1859.12	Zr III
120 r	1823.00	Sn I	10	1838.94	Na III	40	1850.06	Zr III	1000	1859.21	Pd III
800	1823.06	Ni III	110	1839.30	F III	80	1850.15	Au III	150	1859.43	P I
1000	1823.08	Co III	12	1839.32	Sb III	45	1850.15	Na II	500	1859.85	Rh III
25	1823.24	Au II	80	1839.32	Zn III	40	1850.30	In III	120	1859.980	Al II
40	1823.41	Cd III	15	1839.37	Co II	12	1850.38	Na III	500 r	1860.086	Ge I
70	1823.80	Bi II	120	1839.97	F III	6	1850.6	Te I	200 r	1860.32	Sn I
200	1824.22	Yb IV	60	1840.06	Ca II	500	1850.67	Si I	340	1860.34	As II
100 r	1825.35	Cu I	100	1840.14	Cr IV	40	1850.69	Ca II	90 w	1860.37	N V
400	1825.36	Co III	110	1840.14	F III	30	1850.69	Mo IV	100	1860.39	Ag III
6	1825.5	Te I	400	1840.14	Ag III	300	1850.69	V III	6	1860.4	Te I
200	1825.84	V IV	12	1840.24	Fe IV	9	1851.10	In IV	12	1860.42	Fe IV
300	1825.91	B I	200	1840.91	Cu III	40	1851.13	Cd III	10	1860.43	Ca III
750	1825.95	Co III	500	1841.08	Pr IV	70	1851.19	Na II	25	1860.47	Zr III
30	1826.21	Cr IV	100 h	1841.15	Si I	80	1851.22	P I	500	1860.48	Zr V
640	1826.245	S I	200 h	1841.328	Ge I	20	1851.37	Cd III	100	1860.64	Ag III
300	1826.41	B I	200	1841.44	Si I	1500	1851.59	Pd III	600	1860.86	Zr V
60	1826.41	Yb III	10	1841.49	Ti V	30 h	1851.79	Si I	10	1861.21	Na III
20	1826.77	Yb III	60	1841.82	Na II	1000	1851.81	La IV	20	1861.42	Sn I
30	1826.86	Cr IV	1500	1842.34	Co I	50	1851.89	Cr IV	300	1861.56	V IV
30	1827.26	Cr III	30	1842.41	In III	70	1851.91	Zr IV	12	1861.74	Ba III
100	1827.70	Cd II	200 h	1842.410	Ge I	30	1852.00	Sn I	25	1861.77	Zr III
30	1827.93	Mg I	9	1842.55	Si III	400	1852.01	V III	1000	1861.78	Co III
13	1827.98	Fe IV	110	1842.81	B II	6	1852.1	Te I	500	1861.80	Au III
500	1828.40	Cl III	2	1843.00	Pb V	2000	1852.27	Pd III	1000	1862.311	Al II
600	1828.588	Al II	20	1843.09	Ca II	75	1852.36	Yb III	30	1862.32	Ce III
350	1828.83	Ag III	400	1843.49	Pd III	200	1852.46	Si I	250	1862.762	P IV
100	1829.50	Sb I	60	1843.64	Hf III	1800	1852.71	Co I	600	1862.790	Al III
400	1830.01	Ni III	200	1843.77	Si I	1500	1852.77	La IV	120	1862.893	P IV
12	1830.06	Ca III	300	1844.17	Mg IV	500	1852.92	Co III	15	1862.98	In III
200	1830.08	Ni III	11	1844.36	Na III	75	1852.94	Yb III	100	1863.11	Cr IV
2000	1830.09	Co III	100 h	1844.410	Ge I	200	1853.134	Ge I	50	1863.13	Nb III
75000	1830.38	I I	15000	1844.45	I I	50	1853.15	Si I	100	1863.32	Yb III
400	1831.15	V III	50	1844.66	Cd III	80	1853.17	Na II	200	1863.580	P IV
80	1831.38	Zn II	12	1844.67	In IV	30	1853.27	Mn II	2000	1863.83	Co III
2000	1831.44	Co III	400	1844.89	Au III	40	1853.38	Zr III	10	1863.9	Bi III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
75	1864.06	Zr III	500	1878.33	Zr V	8	1892.72	Tl II	15	1910.57	Cd III
100	1864.12	Zn II	300	1878.68	V III	100	1892.92	Nb III	50 h	1910.62	Si II
400	1864.19	Co III	30	1879.09	Pt II	8	1893.19	Pb IV	40	1910.70	Nb IV
7	1864.45	Ti V	12	1879.49	Mg III	200 h	1893.25	Si I	70	1910.86	Yb III
300	1864.51	V III	750	1879.79	La IV	11	1893.98	Fe III	30	1911.41	Mn II
5	1864.85	Yb III	100	1879.83	Au I	10	1894.12	Ca III	40	1911.61	Sn I
100	1865.052	Ge I	70	1880.30	Yb III	75	1894.26	Zn II	50	1911.70	Pt II
500	1865.33	Rb II	250	1880.36	Ag III	1	1894.77	Hg III		1912.	Be I
30	1865.45	Zr III	400	1880.41	V III	300	1895.01	V III	10	1912.12	Bi III
20	1865.52	Sn I	800	1880.66	Rh III	100	1895.197	Ge I	30	1912.409	Ge I
83	1865.92	Ta IV	10	1880.66	Na III	500	1895.37	Co III	60	1912.62	Sc III
30	1865.96	Sn I	200 h	1880.95	Ru III	40	1895.44	Sc III	500	1912.94	As II
100	1866.08	Zn II	700	1881.16	Al IV	20	1895.46	Fe III	20	1913.52	Sn I
45	1866.45	Na II	25	1881.22	Pr III	5	1895.50	Yb III	350	1913.8	Se I
350	1867.12	Ag III	1000	1881.57	La IV	100	1896.18	Yb III	19	1914.06	Fe III
10	1867.23	Yb III	1000	1881.70	Co III	2	1897.02	Pb V	6	1914.09	Kr III
30	1867.24	Cu IV	200	1881.85	Si I	20	1897.29	Sn I	65	1914.25	Zr III
10	1867.63	Yb III	7	1881.89	Ti V	10	1897.57	Yb III	2	1914.33	Pb V
150	1868.10	Ag III	160	1881.91	Na II	500	1898.25	Yb III	9	1914.40	Ar III
50 r	1868.17	Sb I	10	1882.05	Fe III	400	1898.6	Se I	4000	1914.62	Pd III
10	1868.19	Yb III	150 r	1882.56	Sb I	200 h	1899.04	Ru III	20 d	1914.68	Mn II
4	1868.76	Pb I	30	1882.64	Sn I	70	1899.39	Sb I	550	1914.698	S I
5	1868.92	Yb III	40	1883.05	Pt II	100 h	1899.42	Ru III	35	1914.75	Ce IV
160	1869.23	Hg II	35	1883.16	Cr IV	400	1899.81	V III	60	1914.81	Zn II
20	1869.32	Si II	5	1883.2	Tl IV	12	1899.91	Sn II	15	1915.08	Fe III
12	1869.64	Fe IV	6	1883.26	Ge III	15	1900.16	Na III	100	1915.10	Mn II
10	1869.83	Fe III	100 h	1883.56	Ru III	20	1900.28	Hg II	7	1915.56	Ar III
10	1870.07	Yb III	12	1883.92	Ba III	710	1900.286	S I	500	1916.08	Ne II
15	1870.23	Si II	80	1884.22	Yb III	80	1900.76	F III	400	1916.92	Ag III
14	1870.26	Ca III	10000	1884.87	Pr IV	800	1901.32	Rh III	3	1917.03	Be III
300	1870.55	Hg II	500	1884.91	Rh III	1000 h	1901.33	Si I	600	1917.08	Ag III
60	1870.58	Hf III	350	1885.06	N III	60	1901.52	Zn II	300 r	1917.592	Ge I
15	1870.83	Yb III	70	1885.07	Yb III	500	1901.61	Cl III	10	1917.62	Co II
300 r	1871.15	Sb I	50	1885.09	Na II	20 c	1901.63	Lu IV	150	1918.28	Au III
10	1871.15	Yb III	150	1885.15	Hf III	84	1901.63	Ta IV	10	1918.45	Na III
500	1871.87	Co III	300	1885.21	Mn III	500	1902.23	V III	20	1918.64	Mn II
150	1871.92	Au III	400	1885.22	N III	100	1902.41	Bi II	30	1918.71	Cu IV
200	1872.03	Yb III	45	1885.74	Na II	100 h	1902.46	Si II	100 d	1918.96	Zn II
100	1872.13	Zn II	2000	1885.83	Pd III	50	1902.95	Mn II		1919.	Be I
14	1872.37	Ca III	80	1886.05	Sn I	5000	1902.97	La IV	500	1919.12	Co III
100	1872.55	Ag III	15	1886.49	Cd III	15	1903.48	Cd III	300	1919.2	Se I
285	1872.78	O III	12	1886.76	Fe III	5	1903.52	In IV	600	1919.37	Rh III
285	1872.87	O III	70	1887.22	Yb III	100	1904.15	Ba II	150	1919.55	N III
100	1873.10	Si I	500	1887.36	Rh III	50 h	1904.66	Si I	20	1919.64	Au I
15	1873.29	Sn I	10 d	1887.39	Na III	500 r	1904.702	Ge I	30	1919.64	Mn II
45	1873.37	Na II	1000	1887.40	Pd III	10	1904.77	Pb I	4	1919.74	Pb V
400	1873.45	Ag III	20 d	1887.47	Na III	7	1906.74	Yb III	150	1919.77	N III
140	1873.89	Cr IV	200	1887.70	Si I		1907.	Be I	160	1920.04	O III
800	1873.91	Yb III	100	1888.11	Ne II	60	1907.03	Mn IV	7	1920.16	Ti V
150	1874.08	Cd III	100	1888.12	Th III	800	1907.44	La IV	70	1920.27	Zn II
15	1874.08	In IV	650	1888.523	P IV	200	1907.49	Ne II	20	1920.53	Yb III
12	1874.23	Fe IV	700	1888.62	Rh III	10 s	1907.58	Fe III	300	1920.65	N III
300 r	1874.256	Ge I	2	1888.67	Pb V	84	1907.66	Ta IV	110	1920.75	O III
1500	1874.63	Pd III	800	1889.22	La IV	20	1907.84	Mn II	150	1920.84	N III
100	1874.70	Rh III	500	1889.42	Rb II	200	1907.99	N III	80	1921.25	Mn II
50	1874.81	Hf III	50	1889.52	Pt II	100	1908.31	Ru III	200	1921.30	N III
500 h	1874.84	Si I	300	1889.57	Ag III	50 h	1908.434	Ge I	7	1921.471	Pb II
285	1874.94	O III	100	1889.71	Ne II	10	1908.50	Mg III	110	1921.52	O III
60	1875.08	Na II	10	1890.34	Yb III	10	1908.50	Yb III	20	1921.64	Au II
100	1875.41	Yb III	1000 r	1890.42	As I	25 r	1908.64	Tl II	75	1921.96	Zr III
200	1875.54	Hg II	13	1890.67	Fe III		1909.0	Be II	300	1922.23	Cd II
100	1875.81	Si I	15 d	1890.75	Na III	50	1909.30	Sn I	60	1922.41	Nb IV
75	1875.92	Yb III	10	1890.87	Yb III	100	1909.66	Yb III	15	1922.79	Fe III
35	1877.00	Zr III	70	1891.28	Sb I	25	1909.98	Cd III	20	1923.07	Mn II
100	1877.34	Nb V	1500	1891.34	Pd III	30	1910.0	Bi IV	200	1923.34	La III
400	1877.62	Mn III	100	1891.40	Sn I	11	1910.10	Ca III	20	1923.34	Mn II
20	1877.88	Mo IV	1000	1891.47	La IV	500	1910.16	Rh III	100 h	1923.467	Ge I
12	1877.99	Fe III	50	1892.07	Zr III	200	1910.183	P IV	220	1923.49	O III
1500	1878.28	Co I	15	1892.42	Yb III	75	1910.25	Mn IV	110	1923.82	O III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
12	1923.90	Mg III	80	1937.27	Zr III	30	1950.09	Co II	13	1960.32	Fe III
11	1923.96	Na III	14	1937.34	Fe III	20	1950.14	Mn II	12	1960.76	Na IV
500	1924.70	Ba II	100 r	1937.483	Ge I	10	1950.33	Fe III	100	1960.86	Ag III
84	1924.75	Ta IV	800 r	1937.59	As I	40	1950.34	Yb III	500	1960.9	Se I
200	1925.30	Ag III	40	1937.63	Cr IV	30	1950.36	Ce III	30	1961.25	Fe I
80	1925.31	Sn I	11	1937.84	Mg III	200 r	1950.39	Sb I	50	1961.32	Zr III
30	1925.52	Mn II	500	1938.008	Ge II	1500 c	1950.80	La IV	1500	1961.59	Co I
10 p	1926.01	Fe III	100 r	1938.300	Ge I	12	1950.91	Na III	100	1962.01	Zr III
400	1926.24	Zr V	500	1938.57	La III	12	1951.01	Fe III	500	1962.013	Ge I
80	1926.26	Mo IV	200	1938.83	Ne II	400	1951.23	Pr IV	250	1962.04	Mn III
14	1926.26	Na III	100	1938.84	Nb III	14	1951.24	Na III	50	1962.111	Fe I
18	1926.30	Fe III	500	1938.891	Ge II	400	1951.43	V IV	15	1962.80	Yb III
50	1926.59	Mn II	10 l	1938.90	Fe III	400	1951.56	Pd III	3	1962.88	Te II
10	1926.76	Yb III	500	1939.06	V IV	25	1951.571	Fe I	40	1962.92	Zr III
20	1926.77	Sn I	220	1939.261	Al II	1500	1951.90	Co I	300	1963.10	V IV
110	1926.94	O III	5	1939.58	In IV	60	1951.91	Zn II	12	1963.11	Fe II
500	1927.07	Rh III	10	1939.59	Cd III	25	1951.93	Au I	30 h	1963.373	Ge I
100	1927.08	Sb I	10	1939.68	Ca III	150	1952.15	Sn I	80 h	1964.3	Sb I
12	1927.24	Na III	30	1939.80	Pt II	500	1952.36	Mn III	80	1964.54	Zn II
500	1927.43	Zr V	500	1940.15	Co III	1000	1952.52	Mn III	50	1964.59	Be I
30	1927.60	Hg II	77	1940.25	Ta IV	200	1952.54	Ni III	13	1964.61	Ca III
15	1927.95	Sn I	200	1940.25	Zr III	30	1952.59	Fe I	11	1965.08	Na IV
70	1928.09	Yb III	20	1940.58	Sr III	11	1952.65	Fe III	400	1965.16	Rh III
500	1928.57	Co III	100	1941.08	Zr III	80	1953.00	Zn II	30	1965.383	Ge I
40 h	1928.9	Sn I	500	1941.28	Mn III	30	1953.005	Fe I	40	1965.54	Cd II
100	1929.24	Mo IV	500	1941.35	Ru III	30	1953.23	Mn II	85	1966.22	Zr III
30	1929.25	Pt II	2000	1941.64	Pd III	13	1953.32	Fe III	40	1966.31	Cu IV
5	1929.67	Be I	50	1941.67	Si II	10	1953.49	Fe III	400	1966.89	Ag III
100 d	1929.67	Zn II	500	1941.86	Sn III	10	1953.55	Ca III	30	1966.92	Sr III
30	1929.68	Pt II	300	1942.27	Hg II	20	1953.83	B III	80	1967.13	Yb III
250	1929.751	Cu II	45	1942.31	Au I	500	1953.94	Co III	140	1967.18	Cr IV
500 r	1929.826	Ge I	55	1942.59	Yb III	100	1953.95	Zr III	100	1967.38	Ag II
200	1929.978	Al II	20	1942.69	Sn I	1800	1954.22	Co I	10	1967.60	Na IV
300	1930.03	Ne II	250 w	1942.89	Mn III	10 w	1954.22	Fe III	25	1967.81	Zr III
1000	1930.33	Pd III	11	1943.01	Ca III	500	1954.24	Rb II	13	1967.94	Ca III
15	1930.39	Fe III	800	1943.21	Mn III	500	1954.25	Rh III	1500 h	1968.69	Co I
200	1930.43	Ni III	3	1943.31	In IV	9000	1954.53	Bi I	1500 h	1968.93	Co I
15	1930.63	Yb III	14 s	1943.48	Fe III	200	1954.61	Pr IV	20	1969.24	Mn II
13	1930.67	Mg III	10	1943.52	Na III	20 d	1954.81	Mn II	100	1969.40	Zn II
1000	1930.905	C I	100	1943.54	Cd II	75	1954.87	Zn II	20	1969.47	Yb III
150	1931.048	Al II	10	1943.68	Be I	60 h	1954.97	Be III	30	1969.73	Yb III
30	1931.40	Mn II	3	1943.94	Tb IV	100	1954.97	Si I	150	1970.495	Cu II
14	1931.51	Fe III	30 s	1944.116	Ge I	200	1955.115	Ge I	3000	1970.71	Co I
700	1931.79	Rh III	15	1944.59	Si II	1800	1955.17	Co I	200	1970.880	Ge I
100	1932.04	Au III	250	1944.597	Cu II	50	1955.52	Sn III	50	1970.90	Tb IV
200	1932.377	Al II	200	1944.731	Ge I		1956.	Be I	80	1971.06	Mo IV
75	1932.54	Zr III	20	1945.15	Mn II	300	1956.54	Rb II	1800 h	1971.16	Co I
12	1932.74	Na III	12	1945.34	Fe III	300	1956.61	Mn III	200	1971.42	Rb II
25	1933.17	Sn I	100 c	1945.46	Ne II	30	1957.42	Co II	30	1971.46	Sn I
13	1933.89	Na III	60	1945.58	Zn II	200	1957.518	Cu II	100	1971.95	Cu III
300	1934.00	V III	25	1946.12	Zr III	1200 c	1957.57	La IV	120	1972.07	Cr IV
10 h	1934.048	Ge I	10	1946.13	Sb III	700	1957.62	Ag III	300	1972.29	Pd III
50	1934.32	Zr III	900	1946.26	Gd III	60	1957.823	Fe I	4	1972.44	Pb I
400	1934.503	Al II	150	1946.32	Ag III	5	1957.96	Pb V	1800 h	1972.52	Co I
30	1934.538	Fe I	12	1946.43	Na III	200	1958.09	Pr V	585 r	1972.62	As I
150	1934.713	Al II	100	1946.493	Cu II	400	1958.20	Pr V	12	1972.82	Ca III
400	1934.88	Zr V	30	1946.59	Cr IV	30 p	1958.44	Sr III	100	1972.94	Hg II
40	1935.20	Zr III	80	1946.61	Zr III	100	1958.47	Au III	16	1973.16	Pb IV
100	1935.42	Au III	1500	1946.79	Co I	1500	1958.55	Co I	1500	1973.85	Co I
12	1935.72	Ca III	50	1946.988	Fe I	11	1958.58	Fe III	200	1973.89	Hg II
300	1935.840	Al III	50	1946.99	Zr III	10	1958.97	Ca III	10	1973.96	Yb III
15	1935.863	Al III	20	1947.93	Mn II	200	1959.02	Th IV	10	1974.18	Yb III
200	1935.949	Al III	12	1948.26	Ca III	30	1959.25	Mn II	1100	1974.34	Gd III
75	1936.48	Zr III	100	1948.44	Ag III	120	1959.27	Ag III	3	1974.6	Tl IV
1800	1936.58	Co I	200	1948.79	Au III	12	1959.34	Pb IV	11	1974.76	Ba III
75	1936.67	Zr III	10	1949.33	Si II	500	1959.41	Co III	60	1974.99	Zr III
150	1936.907	Al II	20	1949.44	Mo IV	7000	1960.13	Bi I	2200	1975.24	Gd III
10	1937.21	Ce IV	100	1949.56	Si II	60	1960.144	Fe I	600	1975.92	Ag III
25	1937.269	Fe I	30	1949.90	Pt II	15	1960.21	Sn I	25	1976.46	Yb III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
1800	1976.97	Co I	20	1990.52	Lu IV	800	2002.16	Pd III	1200 h	2014.58	Co I
10	1977.01	Ca III	700	1990.531	Al II	1500	2002.32	Co I	40	2014.93	Pt II
150	1977.027	Cu II	20	1990.54	Ce III	200	2002.34	Th IV	19000	2015.11	Mo II
500	1977.03	Ag III	6	1990.60	Sb II	100	2002.48	V IV	100	2015.20	Ru III
10	1977.16	Na III	30	1990.95	Zr III	35	2003.11	Ce IV	30	2015.76	Sn I
300	1977.53	Pd III	100 r	1991.13	As I	100	2003.18	Lu IV	150	2015.96	Ag II
50 h	1977.6	Sn I	50	1991.14	Yb III	230 r	2003.34	As I	150	2016.052	Al II
2	1977.88	Pb I	20	1991.41	Mo IV	25000	2003.53	Re I	15	2016.12	Cd III
30	1978.19	Au I	100	1991.44	Hf III	13000	2003.73	Os I	900	2016.17	Co I
2	1978.22	Ge III	2	1991.60	Pb I	18000	2003.85	Mn I	150	2016.234	Al II
60	1978.22	Nb IV	14	1991.61	Fe III	15	2004.07	Cd III	100	2016.368	Al II
10	1978.55	Ca III	50	1991.85	Si I	10	2004.21	Na III	35	2016.63	Zr III
500	1978.95	Mn III	15	1991.88	Sn I	1000	2004.47	Pd III	12	2017.03	Na III
60 h	1979.07	Nb III	2	1992.31	Pb I	6	2004.73	In IV	500	2017.47	Rh III
200	1979.274	Ge II	200	1993.32	Ru III	9000	2004.78	Os	16000	2017.87	Re I
500	1979.956	Cu II	50	1993.37	Zn II	400	2005.14	Rh III	3400	2018.07	Gd III
2400 h	1980.89	Co I	90	1993.89	Sc III	11	2005.22	Na III	29000	2018.14	Os I
11	1981.19	Ca III	13	1994.07	Fe III	200	2005.71	Ru III	10	2018.39	Na IV
2	1981.74	Yb III	30	1994.23	Mn II	100	2006.46	Ru III	65	2018.44	Ne IV
100	1981.82	Ru III	500	1994.26	Rh III	100	2006.82	Zr III	50	2018.58	Ru III
150	1981.87	Ag III	30	1994.46	Zr III	400	2006.84	Cl III	1700	2019.068	Ge I
100	1982.10	Ru III	20	1994.61	Sr IV	80	2007.01	Ne II	2	2019.22	Ge III
100	1982.11	Zn II	7	1994.83	Te I	50	2007.04	Ge II	29000	2020.26	Os
400	1982.76	Mn III	20	1994.98	Sn I	50 h	2007.28	Nb III	40000	2020.30	Mo II
40	1983.14	Zr III	45	1995.05	Yb III	300	2007.30	Ag III	20	2020.75	Bi III
500	1983.19	Rb II	150	1995.1	Se I	100	2007.49	Cd II	100	2020.94	Lu IV
500	1983.61	Cl III	130	1995.16	Ag III	100 r	2007.56	Tl I	20	2021.15	Bi III
30	1983.74	Pt II	100 r	1995.43	As I	900	2008.04	Co I	7000	2021.21	Bi I
5	1983.88	Yb III	200	1995.43	Cd II	25	2008.05	Sn I	2600	2021.38	Au I
100	1983.92	Lu IV	12	1995.56	Fe III	13000	2008.07	W II	30	2021.52	Zr III
80	1984.20	Sn I	10	1995.68	Na III	15	2008.40	Ba III	5 r	2022.02	Pb I
30	1984.43	Si I	9700	1996.06	Mn I	11	2008.47	Na III	300	2022.19	Mn III
25	1984.62	Yb III	40	1996.18	Lu IV	900	2008.79	Gd III	110	2022.19	Ne IV
5	1985.13	Be I	12	1996.42	Fe III		2009.	Li II	4	2022.25	Ge III
50	1985.15	Nb III	150	1996.85	Au III	100 r	2009.19	As I	50	2022.35	Co II
13	1985.57	Na III	50	1996.92	Zn II		2009.20	Ba II	8700	2022.35	Ir I
	1985.60	Ba II	50	1997.11	Nb III	500	2009.28	Ru III	13	2022.45	Ba III
70	1985.61	Zn II	55	1997.28	Yb III	500	2009.29	Zr V	14000	2022.76	Os I
79	1985.68	Ta IV	450 h	1997.370	Cl II	100	2009.94	Ce IV	100	2023.48	P I
120	1985.682	P IV	65	1997.54	Mn IV	5100	2009.98	W II	20	2023.78	Mo IV
7	1985.74	Yb III	100	1997.55	Ru III	17000	2010.15	Os I	400	2023.95	Ba II
150	1985.851	P IV	55	1997.66	Yb III	4100	2010.23	W II	50	2024.00	Sb I
60	1986.05	Sb I	500	1997.72	V IV	160	2010.42	Sc III	25	2025.05	Cs II
200	1986.114	P IV	400	1997.89	Gd IV	9900	2010.65	Ir I	200	2025.06	Pr IV
80	1986.43	Yb III		1997.95	Be I	70	2010.92	Mo IV	500	2025.48	Zn II
30	1986.89	Cd II		1997.98	Be I	30	2010.97	Si I	80	2025.56	Ne II
100	1986.99	Zn II	60	1998.01	Be I	100	2011.17	Ru III	40	2025.76	Co II
200	1987.02	Ag III	1500 l	1998.49	Co I	200	2011.29	Ge I	9	2025.82	Mg I
150	1987.022	P IV	2	1998.58	Pb V	200	2011.49	Ag III	7300	2026.08	W II
15	1987.50	Fe III	500	1998.82	Yb III	50	2011.51	Co II	60	2026.78	Zr III
300 h	1987.849	Ge I	10	1998.83	Pb V	50	2011.56	Ru III	160	2026.96	O III
150	1987.98	Hg II	500 r	1998.887	Ge I	200	2011.62	Co III	90	2026.97	Hg II
10	1988.26	Bi III	200	1999.32	V IV	50	2011.66	Ru III	30	2026.98	Sn I
300	1988.267	Ge I	14000	1999.51	Mn I	15	2011.87	Na III	50	2027.04	Co II
7	1988.75	Ti V	300	1999.54	Ba II	100	2011.94	Zn II	100	2027.44	F III
15	1988.81	Cd III		Air		11000	2012.00	Au I	40	2027.50	Nb IV
200	1989.22	Ru III	600	1999.59	Ag III	50	2012.26	Sc III	2000	2027.79	Tb IV
25	1989.35	Bi II	250	1999.698	Cu II	3000	2012.42	La IV	1800	2027.82	Gd III
82	1989.44	Ta IV	6	2000.2	Te I	6200	2012.78	Hf II	1000 w	2027.83	Mn III
400	1989.59	Mn III	45	2000.23	Zr III	200	2013.22	Cu III	500 w	2028.14	Mn III
400	1989.60	Co III	100	2000.42	Ce IV	360	2013.27	O III	8500	2028.18	Hf II
400	1989.63	Au III	20	2000.60	Cd III	30	2013.30	Zr III	14000	2028.23	Os I
1500	1989.80	Co I	20	2000.79	Co II	100	2013.32	As I	500	2028.53	Rh III
80 h	1989.82	Yb III	25	2000.81	Au II	150	2013.65	Ag III	600	2028.54	Zr V
50	1989.83	Zr III	100	2001.09	Co III	800	2013.71	Rh III	12	2028.56	Na III
300	1989.855	Cu II	10	2001.30	Ba III	200	2013.88	Co III	200	2029.22	Tb IV
40	1990.25	Cr IV	9600	2001.45	Os I	7	2014.06	Hf IV	3300	2029.32	Nb II
1800	1990.34	Co I	5800	2001.71	W II	11	2014.17	Na III	60 r	2029.49	Sb I
170 r	1990.35	As I	26000	2002.02	Te I	4100	2014.23	W II	15000	2029.98	W II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
120	2030.32	F III	350	2043.802	Cu II	200	2058.48	Pr IV	100	2069.85	Ag I
3200	2030.63	Pt I	50	2044.54	Au II	200	2058.59	Pr III	800	2070.40	Gd IV
12	2031.13	Na III	300	2044.57	Mn III	50	2058.65	Si II	12	2070.43	Ba III
50	2031.46	Pr III	100	2044.59	Ru III	8600	2058.69	Os I	125	2070.43	Zr III
100	2031.81	Co III	10	2044.82	Na III	40	2058.73	Zr III	1500 c	2070.56	Lu III
900	2031.96	Co I	20	2045.12	Zr IV		2058.78	Os I	4200	2070.67	Os II
450	2032.116	Cl II	26000	2045.36	Os I	40	2058.82	Co II	8	2070.9	Te I
4400	2032.41	Pt I	10	2045.44	Na III	50	2059.01	Si II	300	2070.94	Hf III
50	2032.45	Cd II	50	2045.61	Cd III	50	2060.29	Nb III	90	2071.09	N III
50	2032.47	Nb III	220	2045.67	O III	10	2060.36	Na III	20	2071.10	Lu IV
65	2032.53	Nb IV	17000	2045.98	Mo II	50	2060.38	Mo IV	3400	2071.21	W II
3000	2032.99	Nb II	800	2046.02	Gd III	1500	2060.58	Y III	1000	2071.50	Rb II
	2033.25	Be I	200	2047.05	Pr IV	5000	2060.64	Ir I	12	2071.68	Ba III
	2033.28	Be I	40	2047.15	Zr IV	75	2060.83	Zr III	200	2072.02	Si II
100	2033.30	Pr III	80	2047.23	Cr III	200	2061.17	Ag I	200	2072.70	Si II
100	2033.34	Ce III	3000	2048.67	Rh III	40	2061.19	Si I	100	2072.89	Sn I
12	2033.36	Ca III	400	2048.88	Tb IV	10	2061.25	Cd III	100	2073.08	Sn I
	2033.38	Be I	400	2048.93	Mn III	800	2061.30	Gd IV	3000 c	2073.18	La IV
150	2033.47	P I	27000	2049.08	Re I	50	2061.47	Zr III	10	2073.22	Bi III
15000	2033.57	Ir I	20	2049.17	Co II	14000	2061.49	Cr II	14	2073.37	Bi III
150	2033.98	Ag II	800	2049.28	Gd IV	10	2061.55	Fe III	10	2073.40	Eu III
18000	2034.44	Os I	12	2049.34	Pb IV	2000	2061.63	I I	10	2073.64	Yb III
40	2034.67	Nb IV	5500	2049.37	Pt I	13000	2061.69	Os I	200	2074.008	Al II
2700	2035.03	W II	150 r	2049.57	Sb I	9000	2061.70	Bi I	50	2074.12	Zr III
60	2035.15	Cs II	5300	2049.63	W II	20 h	2062.00	Ac IV	4200	2074.70	Re I
100	2035.42	Zr III	500	2049.68	Mn III	500	2062.00	Zn II	500	2074.8	Se I
270	2035.854	Cu II	40	2050.72	Lu III	3	2062.14	Ge III	25	2075.08	Pr III
11	2035.90	Na III	200	2050.73	Pr IV	10	2062.17	Co III	2200	2075.59	W II
75	2036.23	Cd II	5	2050.88	Pb I	50	2063.43	Sb I	10000	2075.95	Rb II
60	2036.39	Cr III	11	2051.48	Na III	40	2063.78	Co II	10	2076.00	Ba III
100	2036.46	Pt II	300	2052.21	Rb II	20	2064.00	Sn I	30	2076.21	Mn II
30	2036.58	Co II	6200	2052.22	Ir I	200	2064.01	N III	2400	2076.43	Ru I
800	2036.72	Rh III	100	2052.30	Pr III	50	2064.08	Pr III	800	2076.66	Gd IV
50	2036.92	Zr III		2052.68	Ba II	2000	2064.11	Rh III	800	2076.84	Rh III
250	2037.127	Cu II	160	2052.74	O III	200	2064.23	Zn II	75 h	2076.94	Be III
50	2037.31	Mn II	500	2052.80	Rb II	250	2064.42	N III	7200	2076.95	Os I
750	2037.43	La IV	50	2052.87	Pr III	25	2064.90	Mg III	160	2077.09	B III
600	2037.61	Rh III	90	2052.93	Hg II	750 r	2065.215	Ge I	900	2077.38	Mn III
40	2037.64	Mn II	200	2053.11	Co III	1500	2065.35	Lu III	80	2077.43	Cs II
100	2037.76	Hf III	150	2053.17	Ag III	8900	2065.42	Cr II	1500 h	2077.76	Co I
21000	2038.44	Mo II	8 r	2053.28	Pb I	30	2065.52	Si I	100	2077.87	Ce III
10	2038.84	Ba III	150	2053.83	Ag III	50	2065.54	Co II	100	2077.92	Zr III
	2039.	Li I	50	2053.85	Pr III	2300	2065.57	W II	30	2078.05	Yb III
1000	2039.15	Pr IV	50	2054.03	Sn I	550	2065.78	B III	7200	2078.09	Os
60	2039.31	Zn II	3	2054.10	Sb III	250	2066.38	B I	300	2078.13	Mn III
15	2039.55	Mg III	100	2054.46	Hf IV	500	2066.38	Mn III	8	2078.45	Pb V
50	2039.63	Cr III	420	2054.461	Ge I	10	2066.49	Yb III	100	2078.663	Cu II
70 r	2039.77	Sb I		2054.57	Ba II	2000 c	2066.50	La IV	200	2078.83	Tb IV
500	2039.8	Se I	20	2054.80	Yb III	15	2066.60	Na III	13	2078.92	Ca III
40	2039.83	Cd III	50	2054.83	Si I	250	2066.65	B I	8	2078.93	Sc IV
1500	2039.95	Co I	300	2054.980	Cu II	100	2066.70	Th IV	14	2078.99	Fe III
40	2039.97	Mn II	500	2055.11	Pd III	100	2066.93	B I	83	2079.01	Ta IV
1000	2040.18	Rh III	15	2055.49	Mg III	300	2067.19	B I	120	2079.08	Zn I
50	2040.66	Sn I	19000	2055.52	Cr II	7800	2067.21	Os II	9700	2079.11	W II
20	2040.90	Sn I	25	2055.64	Mo IV	450	2067.23	B III	12	2079.22	Pb IV
1200	2041.11	Co I	40	2055.73	Cr IV	1500	2067.50	Pt I	100	2079.56	Sb I
150	2041.33	Ag III	85	2055.75	Ta IV	20	2067.56	Ti IV	10	2079.74	Co III
12	2041.53	Ca III	50	2055.90	Be I		2068.	Li II	50	2079.93	Zn II
40	2041.57	Pt II	100	2056.01	Be I	12	2068.24	Fe III	14000	2079.97	Os I
12	2041.66	Na III	10	2056.06	Sc IV	1000 r	2068.33	Sb I	80	2080.05	Cs II
2400 r	2041.712	Ge I	75	2056.13	Zr III	80	2068.58	Sn I	1500	2080.08	Gd III
10	2041.93	Y III	100	2056.21	Co III	40	2068.62	Nb IV	90	2080.34	N IV
5	2042.07	Y III	300	2056.80	Mn III	25	2068.63	Sr III	60 h	2080.38	Be III
300	2042.23	Rb II	200	2056.99	Ag III	2600 r	2068.656	Ge I	25	2080.62	Sn I
10	2042.58	Pb IV	220 h	2057.238	Ge I	120	2068.68	N III	100	2080.99	Zr III
50 d	2042.91	Cr IV	285	2057.5	Se III	45 h	2068.9	Bi II	200	2081.04	Ag III
25	2043.12	Pr III	100	2057.65	Ce III	2000	2068.92	Rb II	100	2081.09	Lu IV
12	2043.29	Na III	500	2057.79	Gd III	4000	2068.98	Y III	6500	2081.16	Te I
1600 r	2043.770	Ge I	70	2058.31	Sn I	1000	2069.02	Mn III	12	2081.35	Ba III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
4800	2081.68	Mo II	80	2091.97	Cs II	300	2099.94	Zn II	10	2113.78	Mo IV
30	2081.81	Zr III	400 c	2092.16	Lu IV	500	2099.97	Mn III	80 r	2113.82	Ag II
150	2082.09	Au II	1500	2092.16	Mn I	8 h	2100.00	Ac II	100	2113.83	Cr III
2900	2082.54	Os I	20	2092.26	Yb III	15	2100.05	Ge III	100 r	2113.93	Sn I
13	2082.91	Na III	10000	2092.36	Zr IV	500	2100.42	Pr IV	30	2113.96	Mn II
300	2083.09	Au III	4700	2092.41	Re II	5	2100.47	Cd III	40	2113.98	Zr III
3700	2083.22	Ir I	240	2092.44	Ne III	5300	2100.63	Os I	35	2114.10	Zr III
2000	2083.23	Pr IV	2100	2092.44	V I	2200	2100.67	W II	50	2114.26	Cr III
200	2083.32	Ce III	2200	2092.50	Mo II	2700	2100.84	Mo II	25	2114.31	Sr III
100	2083.34	Lu III	14000	2092.63	Ir I	100	2100.93	Sn I	15	2114.41	Ca III
2600	2083.77	Ru I	30	2093.	Bi IV	1	2101.17	In IV	50	2114.53	Cr III
3700	2083.92	Re I	4000	2093.11	Mo II	1500	2101.54	W I	10	2114.53	Na IV
55	2084.07	Nb IV	35	2093.12	Nb IV	200	2102.18	Zn II	30	2114.63	Si I
100	2084.122	Fe I	50	2093.30	Nb IV	40	2102.30	Zr III	100	2114.87	Cr III
800	2084.23	Mn III	900	2093.40	Co I	15	2102.42	Ge III	10	2115.066	Pb I
10	2084.35	Fe III	200	2093.49	Pr III	20	2102.50	Mn II	30	2115.57	Pt II
3000	2084.59	Pt I	10	2093.50	Eu III	18	2103.16	Ti IV	20	2116.44	Tc II
150 h	2085.33	Hf III	300	2094.14	Mn III	50	2103.16	Zr III	300	2116.50	Rb II
25	2085.35	Zr III	2000 r	2094.258	Ge I	30 h	2103.21	Si I	900	2116.65	Yb IV
80	2085.45	Au III	700	2094.264	Al II		2103.24	Ca II	2500	2116.67	Yb II
150	2085.47	Ne II	1000	2094.29	Gd IV	1000	2103.33	Pt I	320	2117.310	Cu II
10000	2085.59	Re I	40	2094.35	Sn I	15	2103.42	Bi III	100	2117.53	Cr III
900	2085.67	Co I	150	2094.744	Al II	100	2103.63	Lu IV	90	2117.59	N III
400 c	2085.70	Lu IV	6100	2094.75	W II	12	2103.80	Fe III	2100	2117.66	Os I
3100	2085.74	Ir I	10	2094.77	Yb III	10	2103.89	In II	900 s	2117.68	Co I
15	2085.90	Mg III	500	2094.78	Mn III	25	2104.23	Zr III	20	2117.90	Sr IV
420	2086.021	Ge I	300	2094.791	Al II	1500	2104.29	Mo II	4800	2117.96	Os I
600 c	2086.47	Lu IV	900	2094.86	Co I	20	2104.38	Sr IV	80 r	2118.48	Sb I
200	2086.78	Zr III	100	2095.104	Al II	1000 c	2104.41	Lu IV	30	2118.48	Sr III
200	2086.96	Ne III	35	2095.13	Au II	150	2104.42	Zn I	1000	2118.53	Rh III
60	2087.33	Zn I	200	2095.141	Al II	25	2104.45	Ge III	25	2118.56	Be III
10	2087.37	Yb III	80	2095.31	Yb III	1500	2104.73	Co I	1000	2118.63	Rh III
900	2087.55	Co I	160	2095.53	N II	320	2104.797	Cu II	2100	2118.87	W II
75	2087.91	Cd III	400	2095.54	Ne III	240	2105.824	Ge I	12	2118.97	Sc IV
50	2087.98	Yb III	900	2095.77	Co I	1500	2106.18	W II	20	2119.18	Yb III
3600	2088.19	W II	150	2096.00	Cd II	15	2106.23	Tc II	15	2119.41	Tc I
15	2088.58	Co III	180	2096.11	Ne II	12 d	2106.33	Na IV	50	2119.52	Sr III
350 h	2088.583	Cl II	1200	2096.18	Hf II	300	2106.48	Yb IV	1800	2119.54	Ir I
80	2088.71	Cs II	70	2096.20	N II	10	2106.71	Yb III	100 h	2119.69	Hf III
50 h	2088.74	V IV	120	2096.25	Ne II	1500	2106.80	Co I	6600	2119.79	Os
17000	2088.82	Ir I	200	2096.39	Sn I	500	2107.10	Tm III	3	2120.18	Si IV
500	2088.91	B I	15	2096.79	Yb III	10	2107.32	Fe III	50	2121.26	Sn I
2900	2089.03	Os I	25	2096.85	Pr III	200 c	2107.85	Lu IV	500	2121.29	Yb IV
2200	2089.14	W II	110	2096.86	N II	1400	2108.02	Mo II	90	2121.50	N III
2900	2089.21	Os I	80	2096.93	Zn I	200	2108.06	Rb II	2400	2121.59	W II
900	2089.35	Co I	50	2096.94	Pr III	1000 c	2108.31	Lu IV	15 h	2122.27	Be III
300	2089.43	Ne III	40	2097.03	Zr III	900	2108.98	Co I	100	2122.55	Ce III
40	2089.50	Zr III	9800	2097.12	Re I	400	2109.07	Ce III	20	2122.68	Nb IV
2400	2089.52	Mo II	10	2097.45	Cd III	2700	2109.22	Re I	75	2122.74	Zn II
500	2089.57	B I	20	2097.46	Mn II	2000	2109.42	Nb II	250	2122.84	Yb IV
100	2089.96	Ce III	15	2097.48	Fe III	50	2109.54	Yb III	350	2122.980	Cu II
1000	2089.98	Tb IV	1200	2097.51	Co I	1700	2109.58	Mn I	17	2123.03	Ca III
220	2090.0	Se IV	6000	2097.60	Os I	4600	2110.26	Bi I	300	2123.25	Mn III
600	2090.05	Mn III	10	2097.63	Co III	200 h	2110.31	Hf III	800	2123.32	Yb IV
12	2090.14	Fe III	12	2097.69	Fe III	1300	2110.34	W II	80	2123.53	Cr III
300	2090.25	Mn III	13	2097.93	Mg III	60	2110.68	Au II	1900	2123.84	Os I
1000	2090.29	Rb II	500	2097.93	Mn III	30	2111.44	Co II	100	2124.12	Si I
1700	2090.48	W I	20	2098.14	Au II	75	2111.53	Ta IV	30	2124.69	Eu III
10	2090.51	Co III	1800	2098.20	Gd III	50	2111.60	Cd III	95 h	2124.744	Ge I
200	2090.75	Pr III	30	2098.36	Yb III	6	2111.758	Pb I	40	2125.06	Zr III
2400	2090.89	Ru I	110	2098.398	Cu II	300	2112.100	Cu II	10	2125.16	Ar III
20	2091.23	Yb III	50 r	2098.41	Sb I	8	2112.31	In IV	1700	2125.21	Nb II
20	2091.34	Ga II	13	2098.49	Ca III	25	2112.65	Cs II	1000	2125.25	Rb II
350 h	2091.458	Cl II	2400	2098.60	W II	2700	2112.68	Ir I	30	2125.29	Au II
10000	2091.49	Zr IV	500	2099.11	Tm III		2112.76	Ca II	2000	2125.44	Ir I
30	2091.58	Sn I	200 h	2099.30	Hf III	15	2112.77	Mg III	10	2125.57	Be I
2	2091.85	Sb III	200	2099.44	Lu III	100	2112.99	As I	20	2125.68	Be I
15	2091.89	Mo IV	15	2099.50	Cs II		2113.15	Ca II	1300	2125.68	Gd III
20	2091.96	Mg III	50	2099.59	Sr III	100	2113.73	Cr III	600	2125.72	Yb IV

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
350	2126.044	Cu II	15	2140.72	Na III	20 r	2151.43	Sn I	600	2165.17	Pt I
1100	2126.54	Nb II	25	2140.73	Sn I	1000	2151.44	Ce III	75	2165.19	Mo III
15	2126.63	Au I	400	2141.04	Yb IV	30	2151.54	Sn II	160	2165.2	Se IV
3000	2126.74	Yb II	100	2141.15	Cr III	15	2151.78	Fe III	2	2165.26	Er III
4500	2126.81	Ir II	20	2141.43	Sn I	8	2151.96	Pb IV	135	2165.52	As I
5	2127.00	Sb III	10	2141.80	Sb II	1000	2152.23	Rh III	1000	2165.55	Ni II
15 h	2127.20	Be III	50 r	2141.83	Sb I	16	2152.43	Ca III	250	2165.55	Yb IV
100 r	2127.39	Sb I	200	2142.20	Yb IV	3500	2152.68	Ir II	1400	2165.96	Sr II
100 c	2127.43	Lu IV	10	2142.55	Pb V	50	2152.76	Cr III	15	2166.19	Ar III
4	2127.47	Si IV	1600	2142.74	Re II	1400	2152.84	Sr II	150	2166.21	Ag III
2000	2127.52	Ir I	160	2142.78	N II	100	2152.94	P I	60	2166.25	Cr III
4500	2127.94	Ir I	30	2142.80	Sr III	100	2153.21	Rb III	1500	2166.32	W II
10000	2127.98	Y III	18000	2142.81	Te I	850	2153.56	W II	160	2166.6	Se IV
950	2128.61	Pt I		2142.97	Re I	15	2154.01	Pb IV	40	2166.773	Fe I
	2128.75	Ca II	200	2143.10	Rb II	30	2154.08	In III	3000	2166.88	Ce III
20	2128.79	Co II	1500	2143.23	La IV	150	2154.08	P I	10	2166.88	In II
14	2129.19	Ca III	15	2143.40	Bi II	15000	2154.18	Yb IV	3100	2166.90	Os I
200	2129.65	Yb IV	300	2143.42	Yb IV	1000	2154.31	Pr IV	12	2166.95	Fe III
400	2129.82	Rb II	15	2143.46	Bi II	2	2154.42	In III	10	2167.12	Eu III
110	2130.18	N II	30000	2143.83	Rb II	2600	2154.59	Os I	80	2167.33	Au III
25	2130.23	Nb IV	300	2143.89	Yb IV	50	2155.06	Cd II	3000	2167.33	Rh III
80 h	2130.24	Nb III	20	2143.91	Th IV	100 h	2155.34	V IV	1100	2167.75	Os I
30	2130.69	Pt II	100	2144.08	As I	200	2155.66	Hf III	4900	2167.94	Re I
	2131.	Li II	80	2144.15	Cr III	10	2155.76	Na IV	10	2167.97	Pb V
1500	2131.18	Nb II	1900	2144.23	Pt I	2900	2155.81	Ir I	10	2168.26	Ar III
	2131.51	Ca II	100	2144.24	Pt II	30	2156.27	Tc I	2000	2169.10	Ni II
	2132.30	Ca II	1000 r	2144.41	Cd II	200	2156.29	Tm III	300	2169.12	Yb IV
600	2132.42	Zr V	14	2144.54	Na III	16	2156.37	Ba III	5800	2169.42	Ir II
50	2133.12	Sr III	20000	2144.77	Yb IV	3700	2156.67	Re I	2000	2169.48	Ce III
2500	2133.63	Bi I	100 r	2144.86	Sb I	100	2157.17	Cr III	1000	2169.78	Mn III
1000	2133.79	Br IV	25	2145.	Be I	150	2157.28	Cu III	500 r	2170.00	Pb I
15	2133.87	Ar III	1000	2145.02	Br IV	12	2157.71	Fe III	15	2170.00	Ag I
14	2133.96	Ca III	60	2145.60	Ag II	50	2157.794	Fe I	20	2170.23	Ar III
10 h	2133.99	Si II	20	2145.74	Sr III	850	2157.80	W II	75	2170.57	Mo III
16	2134.06	Mg III	45	2146.36	Nb IV	1300	2157.84	Os I	100	2170.70	Cr III
10	2134.15	Co III	300	2146.47	Ag III	7900	2158.05	Ir I	20	2170.75	Au I
420	2134.341	Cu II	100	2146.75	Cs II	3000	2158.17	Rh III	12	2171.04	Fe III
10	2134.87	Ba III	30	2146.81	Th IV	12	2158.47	Fe III	80	2171.32	Sn I
500	2135.21	Yb IV	50 h	2146.83	V IV	1200	2158.53	Os I	40	2171.44	F IV
100	2135.47	P I	1500	2146.87	Ta II	50	2158.91	Sb I	12	2171.57	Ca III
900	2135.981	Cu II	50	2147.16	Cr III	100	2159.08	Au III	2100	2171.65	Os I
200	2136.18	P I	3200	2147.25	Te I	40	2159.24	Zr III	200	2172.16	Yb IV
30 h	2136.40	Si II	90	2147.31	N III	360	2159.85	Te I	200	2172.20	Au III
50 h	2136.56	Si II	75	2147.42	Zn II	10	2160.76	Ba III	50	2172.46	Mo III
285	2136.6	Se IV	50	2147.56	Cr III	2400	2161.00	Os	30	2173.33	Co II
200	2136.67	Tm III	50 h	2147.91	Si I	200	2161.22	Ne III		2173.4	Li I
500	2136.95	Ce III	70	2148.00	Hg II	10	2161.27	Fe III	10	2173.59	Eu III
50 r	2137.05	Sb I	1400	2148.03	Gd III	150	2161.320	Cu II	700	2174.15	Mn III
5300	2137.11	Os I	400	2148.10	Yb IV	370	2161.60	Yb II	1100	2174.60	Co I
5	2137.25	Be III	10 w	2148.14	Pr III	600	2161.89	Ag III	15	2174.66	Fe III
300	2137.58	Yb IV	3700	2148.22	Ir I	15	2162.02	Fe II	2000	2174.67	Ni II
900	2137.78	Co I	15	2148.46	Sn I	40	2162.20	Zr III	1500	2174.67	Pt I
35	2137.90	Zr III	300	2148.52	Yb IV	8	2162.25	At I	250	2174.982	Cu II
500	2138.35	Yb IV	1	2148.63	Sn II	50	2162.27	Pd II	55	2174.99	Be I
35	2138.45	Zr III	50	2148.65	Cr III	50	2162.82	Th III	55	2175.10	Be I
200	2138.53	Yb IV	10	2148.73	Ar III	2100	2162.88	Ir I	1500	2175.15	Ni II
800 r	2138.56	Zn I	40 r	2148.73	Sn I	250	2162.94	C III	4500	2175.24	Ir I
10	2138.59	Ar III	400	2148.984	Cu II	900	2163.03	Co I	7	2175.580	Pb I
900	2138.97	Co I	200	2149.14	P I	3000	2163.19	Rh III	100	2175.80	Zr III
250 w	2139.02	Po I	50	2149.18	Th III	10000	2163.68	Zr IV	1500 r	2175.81	Sb I
3400	2139.04	Re II	150	2149.19	Ag III	300	2163.77	Ne III	3400	2176.21	Re I
80	2139.11	Cr III	50	2149.48	Cr III	50	2163.86	Cr III	1700	2176.84	Gd III
1000	2139.44	Rh III	500	2149.82	Pd III		2164.	Li II	900	2176.87	Mn III
100 r	2139.69	Sb I	2400	2149.97	Os	500	2164.2	Se I	5	2176.89	Si III
25	2139.85	Zr III	200	2150.18	Zr V	9	2164.43	Sc IV	500	2177.09	Ni II
800	2139.99	Yb IV	2500	2150.54	Ir I	20	2164.44	Co II	25	2177.22	Ar III
1100	2140.13	Ta II	740	2150.62	Ta II	250	2164.59	Rb III	400	2177.36	Ni II
5	2140.33	Mo IV	60	2150.70	Al I	600	2165.01	Ta II	12	2177.46	Pb IV
13	2140.36	Ca III	2	2150.80	Ca I	1300 r	2165.09	Cu I	300	2177.53	Yb IV

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
500	2177.55	Pd III	150	2188.38	N III	80	2200.390	Fe I	20	2211.85	Eu III
500	2177.63	Pd III	35	2188.81	Au II	20	2200.40	Co II	200	2211.85	Ne III
20	2177.70	Mg III	500	2188.97	Au III	100	2200.509	Cu II	400	2211.95	Mn III
740	2178.03	Ta II	30	2189.06	Tc I	80	2200.724	Fe I	50	2212.15	Pd II
300	2178.118	Fe I	130	2189.47	Cs II	5	2200.73	Ca I	100	2212.25	Tm III
2700	2178.17	Ir I	8	2189.603	Pb I	8000	2200.76	Y III	600	2212.42	Mn III
30	2178.91	Sr III	700	2189.630	Cu II	200 r	2201.32	Sb I	20	2212.63	Eu III
1600 r	2178.94	Cu I	90 h	2189.90	Yb IV	25	2201.32	Au II	25	2213.15	Cs II
250 r	2179.19	Sb I	6	2190.00	K II	600	2201.41	Ni II	100	2213.54	Hf III
6	2179.25	Sb II	50	2190.09	Cr III	400	2202.22	Pt I	30	2213.55	Bi III
400	2179.35	Ni II	30	2190.32	Pt II	2	2202.24	In I	20	2213.65	Fe II
75	2179.37	Mo III	200	2190.36	Rb II	80	2202.27	Yb III	240	2213.76	Ne III
700	2179.410	Cu II	1100	2190.38	Ir II	760	2202.49	Os I	540	2213.85	Mn I
130	2179.60	Cs II	10	2190.59	Eu III	50 h	2202.58	Pt II		2214.	Li II
2	2179.90	In I	20	2190.68	Co II	15	2202.83	Na III	40 h	2214.0	Bi II
30	2180.14	Sr III	100	2190.76	Cr III	40 p	2202.95	Co II	4200 c	2214.26	Re II
200	2180.29	P V	3	2190.77	Er III	2000	2203.15	Ce III	10 w	2214.45	Pr III
12	2180.41	Fe III	2	2190.84	In I	100	2203.22	Cr III	1600 r	2214.58	Cu I
800	2180.47	Ni II	50	2190.88	Sr III	10	2203.534	Pb II	2200	2214.58	Re I
5000	2180.64	Ce III	100	2191.15	Zr III	300 h	2203.80	Po	20	2214.66	Eu III
200	2180.89	Ne III	16000	2191.16	Y III	50	2203.86	Sr III	500	2214.7	Ba II
60	2181.00	Al I	5	2191.57	Be III	30	2203.88	Ne IV	250	2215.106	Cu II
1700 r	2181.72	Cu I	100	2191.58	Cr III	1300	2204.48	W II	800	2215.21	Mn III
800	2181.86	Mn III	740	2191.64	Ir I	1000	2205.13	Pr IV	10 w	2215.25	Pr III
20	2181.99	Co II	250	2191.839	Fe I	50	2205.28	In II	10	2215.34	Eu III
25	2182.14	Cs II	35	2192.05	Zr III	11	2205.46	Sc IV	420	2215.60	Ta II
50	2182.35	Pd II	15	2192.06	Ar III	10 w	2205.48	Pr III	35	2215.63	Au II
2	2182.40	In I	3000	2192.09	Ni II	5000	2205.55	Ni II	1000 r	2215.65	Cu I
1200	2182.71	Ta II	900	2192.268	Cu II	100	2205.85	Ge II	60	2216.07	La III
480	2182.90	W I	20	2192.50	Co II	60	2206.01	Nb III	300	2216.07	Ne III
800	2182.98	Tm III	540	2193.20	Ta II	8000	2206.03	Y III	6000	2216.48	Ni II
	2183.	Li II	120	2193.34	Yb IV	160	2206.09	N II	120	2216.67	Si I
400	2183.32	Yb IV	40	2193.35	Tc I	10 w	2206.26	Pr III	10000	2217.08	Rb II
200	2183.50	Hf III	300	2193.37	Pr IV	60	2206.33	Zr III	10 w	2217.12	Pr III
1000	2183.71	Ce III	200	2193.60	Co II	50	2206.62	Th III	120	2217.17	F III
50	2183.71	Cr III	1100	2193.88	Ta II	4000	2206.72	Ni II	30	2217.23	Eu III
300	2183.91	Tm III	10 w	2194.24	Pr III	40	2206.97	Zr III	20	2217.99	Sr IV
8	2184.06	Ar III	840	2194.39	Os II	100	2207.00	Rh III	1	2218.04	Ga I
100	2184.11	Au III	150 r	2194.49	Sn I	500	2207.14	Ta II	120	2218.06	Si I
100	2184.37	Mo III	440	2194.52	W II	90	2207.64	Ta IV	750	2218.108	Cu II
800	2184.60	Ni II	1000	2194.56	Cd II	300	2207.86	Rb II	3000	2218.11	Ce III
10	2184.68	Eu III	10	2194.81	Eu III	110	2207.98	Si I	12	2218.26	Fe II
960	2184.68	Os I	200	2195.44	Hf III	910	2208.09	Ir II	5	2218.43	Cd III
800 w	2184.87	Mn III	1700 h	2195.54	Lu II	15	2208.41	Fe II	50	2218.91	Si I
100	2185.01	Cr III	15	2195.67	In II	300 r	2208.45	Sb I	30	2219.33	Eu III
600	2185.13	Mn III	400	2195.683	Cu II	6	2208.50	Sb II	20	2219.42	Eu III
30	2185.39	Tc I	1500	2196.03	Ta II		2208.61	Ca II	50	2219.50	Sr III
11	2185.43	Sc IV	150	2196.043	Fe I	60	2208.70	Cr III	50	2220.05	Sr III
2500	2185.50	Ni II	10 w	2197.25	Pr III	9	2208.74	Te I	70	2220.30	B II
850	2185.71	Yb II	2	2197.41	In I	290	2208.81	Mn I	1300	2220.37	Ir I
5000	2185.94	Tm III	4000 c	2197.45	La IV	10 p	2208.85	Fe III	15	2220.375	Ge I
270 h	2186.13	Yb IV	100	2197.62	Ge II	200	2209.35	Ne III	20	2220.38	Fe II
150	2186.42	P V		2197.79	Ca II	400 r	2209.65	Sn I	800	2220.40	Ni II
50 h	2186.451	Ge I	100	2197.89	Cr III	4	2209.67	Sn II	100	2220.51	Cs II
250	2186.486	Fe I	600	2197.99	Rb II	2	2209.75	Tl I	900	2220.55	Mn III
50	2186.76	Ag II	20	2198.14	Yb III	200	2209.806	Cu II	300	2220.67	Po I
60	2186.892	Fe I	10	2198.15	Er III	1400 d	2210.03	Ta II	150 r	2220.73	Sb I
60	2186.9	Bi II	600	2198.26	Rb II	60	2210.18	Zn II	10	2220.81	Ne IV
30	2187.01	Co II	150	2198.27	Yb IV		2210.19	Ta II	500	2221.06	Ni II
270	2187.17	Yb IV	100	2198.62	Cr III	750	2210.268	Cu II	790	2221.07	Ir II
120	2187.195	Fe I	340 r	2198.714	Ge I	4	2210.53	K II	1000 w	2221.12	La IV
2	2187.40	In I	10	2199.22	Ti III	100 r	2210.71	Tl I	10	2221.83	Fe III
1600	2187.43	Ir II	300 r	2199.34	Sn I	540	2210.82	Hf II	770	2221.84	Mn I
100	2187.79	Cd II	10	2199.52	In III	115	2210.89	Si I	100	2221.98	Sb I
240	2187.87	La II	1700 r	2199.58	Cu I	100	2211.02	Mo III		2222.	Li II
7	2187.888	Pb I	90	2199.58	Ta IV	40	2211.05	Sn I	5000	2222.01	Ce III
5	2188.13	Cd III	1500	2199.67	Ta II	3	2211.14	In I	200	2222.13	Po I
200	2188.20	N III	50	2199.74	Th III	150	2211.23	Ag III	14	2222.22	Sc IV
10	2188.22	Ar III	1300 r	2199.75	Cu I	110	2211.74	Si I	320	2222.61	Pt I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
900	2222.96	Ni II	10	2235.91	Fe III	460	2248.75	W II	300	2259.511	Fe I
10	2223.13	Eu III	1000	2236.14	Lu III	h	2249.21	Li II	290	2259.53	Ru I
50	2223.19	Mo III	2000	2236.22	Lu III	2000	2249.25	Ce III	65	2259.57	Ne V
10 w	2223.23	Pr III	1700	2236.73	Gd III	5	2249.30	I IV	10	2259.99	In I
200	2223.79	Rb II		2237.	Li II	150	2249.30	Pt I	150	2260.00	Co II
1700	2223.95	Gd III	10 w	2237.26	Pr III	3	2249.31	I III	5	2260.30	La III
1	2223.98	Er III	3	2237.34	Kr IV	480	2249.79	Ta II	1300 r	2260.53	Cu I
5	2224.43	Cd III	20	2237.425	Pb I	460	2249.80	W I	20	2261.26	In III
1	2224.43	I III	150	2237.59	Cr III	18	2249.98	Nb IV	2	2261.26	Th IV
640	2224.46	Yb II	400	2237.72	Rb II	1700	2250.18	Gd III	150	2261.41	Y III
90	2224.64	Yb IV	12	2237.77	Ti III	500	2250.65	Rb II	840	2261.42	Ta II
120 r	2224.93	Sb I	1	2238.12	I III	1200	2250.76	Ta II	80	2261.57	Y III
5000	2225.08	Ce III	10	2238.16	Fe III	50	2250.790	Fe I	12	2261.59	Fe III
4	2225.13	In IV	20	2238.36	La III	50	2250.84	Rh III	260	2261.62	Ta II
6	2225.15	Sb II	100	2238.40	Ag III	25	2251.14	Zr III	10	2261.88	Eu III
2100 r	2225.70	Cu I	1100 r	2238.45	Cu I	60	2251.17	Sn I	175	2262.08	Ne IV
15	2225.93	Na III	10	2239.06	Pr III	200	2251.43	Rb II	60	2262.210	Hg II
1700	2226.42	Re I	10	2239.42	Pr III	80	2251.45	Cr III	60	2262.23	Hg II
200	2226.72	Cr III	1400	2239.48	Ta II	14	2251.47	Na III	100	2262.26	Yb III
150	2226.780	Cu II	1200	2239.84	Gd III	30	2251.52	Pt II	990	2262.30	Ta II
900	2227.34	La IV	300	2240.11	Yb III	60	2251.874	Fe I	300 r	2262.51	Sb I
1000	2227.42	Mn III	10	2240.14	Eu III	30 h	2251.92	Pt II	2200 r	2263.08	Cu I
75	2227.42	Ne V	25	2240.16	Au II	1300	2252.15	Os I	200	2263.2	As IV
1600 r	2227.78	Cu I	60	2240.31	Nb III	20	2252.72	F V	240	2263.21	Ne III
3000	2227.84	Ce III	20	2240.49	Sr IV	700	2253.07	Cl III	65	2263.39	Ne V
600	2227.98	Os I	30 h	2240.99	Pt II	150	2253.1	As IV	200	2263.54	Rb II
3000	2228.05	Ce III	400	2241.53	V III	100	2253.18	Mo III	80	2263.62	Au II
360	2228.25	Bi I	12 p	2241.54	Fe III	2100	2253.38	Ir I	150	2263.786	Cu II
80	2228.53	Na II	3	2241.66	In I	20	2253.38	Sr IV	18	2263.88	Au II
350	2228.868	Cu II	1	2242.11	Th IV		2253.49	Ir I	500	2263.94	Rb II
130	2228.88	Cs II	10 w	2242.15	Pr III	500	2253.85	Ni II	60	2264.389	Fe I
45	2228.88	Au II	5000	2242.29	Ce III	320	2254.01	Hf II	2000	2264.39	Re I
10	2229.18	F V	900	2242.618	Cu II	800	2254.19	Rb II	1000	2264.46	Ni II
10	2229.27	Fe III	2500	2242.68	Ir II	200	2254.55	Rb II	110	2264.54	Ne IV
60	2229.53	Ag II	500	2242.68	Ni II	250	2254.58	Cs II	1400	2264.60	Os I
2500 r	2230.08	Cu I	350	2243.06	Y II	1000	2254.73	Ba II	830	2264.61	Ir I
20	2230.33	Ba III	200	2243.34	Tm III	260	2254.86	Ta II	2000	2264.85	Ce III
30	2230.33	Na III	1500	2243.75	Gd III	1	2255.03	Ga I	200	2264.91	Ne III
10 w	2230.35	Pr III	400	2243.98	Tm III	2100	2255.10	Ir I	1000	2265.02	Cd II
20	2230.41	Sr IV	10	2244.01	At I	160	2255.15	Hf II	5	2265.04	K II
1700	2230.61	Bi I	150	2244.10	Cr III	10	2255.49	Te I	10	2265.52	Te I
100	2230.66	Rh III	60	2244.19	Nb III	690	2255.52	Ru I	60	2265.63	Nb III
5	2230.70	In I	90	2244.20	Yb IV	440	2255.73	Re I	200	2265.67	Yb III
300	2230.86	Tm III	2300 r	2244.26	Cu I	25	2255.77	Fe II	300	2265.70	Pr IV
30	2231.00	Zr III	100	2244.28	Yb III	440	2255.77	Ta II	250	2265.71	Ne V
30	2231.18	Au II	3000	2244.95	La IV	30	2255.79	In II	20	2265.74	Eu III
400	2231.25	Tm III	50	2245.36	Zr III	1400	2255.81	Ir I	7500 w	2265.91	La IV
150	2231.28	Yb IV	65	2245.48	Ne V	2000	2255.85	Os II	10	2266.22	Tc II
100 r	2231.59	Pd II	100	2245.52	Pt II	2	2255.95	Er III	5	2266.26	In III
80 r	2231.72	Sn I	25	2245.58	Fe II	18	2256.001	Ge I	1100	2266.33	Ir I
100	2231.81	Cr III	8	2245.60	Er III	860	2256.19	Re I	250	2266.83	Hf II
5	2232.18	In III	800	2245.61	Ba II	360	2256.51	Ta II	50	2267.03	Sr III
16	2232.19	Na III	620	2245.76	Ir II	200	2256.73	Co II	80	2267.085	Fe I
4	2232.35	Er III	400 r	2246.05	Sn I	770	2256.76	La II	30	2267.19	Sn I
110	2232.41	Ne V	300	2246.06	Pr V	200	2257.03	Yb III	10	2267.42	Fe III
10	2232.43	Fe III	6	2246.07	Sn II	1300	2257.05	Gd III	80	2267.469	Fe I
10	2232.69	Fe III	300	2246.20	Pr V	1000	2257.21	Br IV	350	2267.61	Cs II
500	2232.91	V III	100 r	2246.43	Ag II	200	2257.82	Cs II	100	2268.00	Rb III
50 h	2233.11	Pt II	500	2246.51	Ag III	40	2257.83	Zr III	2000	2268.20	Ce III
90	2233.30	Yb IV	200	2246.68	Tm III	50	2257.92	Cr III	360	2268.28	Os I
100	2233.81	Cr III	20 h	2246.70	Na III	250	2258.02	Ne IV	500	2268.30	V IV
40	2234.09	B III	20	2246.86	Pb I	25	2258.35	Cs II	190	2268.84	Pt I
70	2234.59	B III	25	2246.89	Pb I	350	2258.51	Ir I	1000	2268.90	Ir I
200	2234.59	Hf III	1000	2247.002	Cu II	25	2258.61	La III	400 r	2268.91	Sn I
1100	2234.61	Os I	5	2247.55	Hg I	500	2258.71	Ta II	500	2268.95	Cl III
10	2235.17	Eu III	240	2248.48	Ta II	1400	2258.86	Ir I	400	2269.10	Al I
60	2235.28	Er III	70	2248.56	Au II	20	2259.01	Pb V	120	2269.22	Al I
920	2235.44	Re I	7	2248.73	Ar III	500	2259.02	Te I	80	2269.36	Er III
200	2235.91	Cr III	75 r	2248.74	Ag II	1	2259.23	Ga I	10	2269.39	Eu III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
200	2269.39	Tm III	100	2280.08	Tm III	140	2288.57	Rh I	2000	2298.70	Ce III
220	2269.56	Ta II	30	2280.68	Ba III	120	2288.98	Sb I	2	2298.70	In I
400	2269.69	Mo II	950	2281.02	Ir II	990	2289.16	Ta II	300	2298.80	Rb II
150	2269.71	Mo III	7	2281.22	Ar III	50	2289.23	Cr III	70	2299.21	Cr IV
960	2270.17	Os I	100	2281.27	Tm III	150	2289.27	Pt I	80	2299.220	Fe I
2000	2270.21	Ni II	30	2281.43	Zr III	570	2289.32	Os I	100	2299.47	Cu III
180	2270.24	W II	100	2281.51	Nb III	1600	2289.98	Ni I	460	2299.53	Ir I
50	2270.862	Fe I	1600	2281.62	Re I	100	2290.36	Nb III	90	2299.59	Cr IV
40	2270.91	C V	40	2281.64	In II	80	2290.66	Cr III	4	2299.72	Ar IV
11	2271.33	Sc IV	660	2281.91	Ir I	35	2291.03	Si I	390	2299.77	Re I
95	2271.37	W I	10	2282.12	Tc I	6	2291.26	Kr IV	150	2299.85	Ti I
30 h	2271.72	Pt II	320	2282.19	Ta II	25	2291.40	Au II	150	2300.12	Rb III
740	2271.85	Ta II	7	2282.21	Ar III	100	2291.45	Pd III	300	2300.142	Fe I
150	2272.070	Fe I	1400	2282.26	Os II	50	2291.59	Th III	200	2300.35	O II
780	2272.09	Ru I	20	2282.26	Sn I	40	2291.62	Eu III	1000	2300.38	Gd III
5	2272.41	In III	10	2282.71	Tc I	5000	2291.71	Rb II	910	2300.50	Ir I
990	2272.59	Ta II	100	2282.86	Tm III	200	2291.98	Co II	3000	2300.65	Ce III
140	2272.61	Ti I	200	2282.98	Tm III	150	2292.40	Pt I	630	2300.78	Ni I
1000	2272.73	Br IV	150	2282.99	Yb III	1300	2292.51	Gd III	10	2300.85	Ar III
5	2272.84	In III	25	2283.30	Au II	300	2292.524	Fe I	10	2300.90	In III
50	2273.15	Zn II	30 d	2283.42	O II	180	2292.54	Ta II	8	2300.93	Si III
180	2273.28	Ti I	200	2283.52	Co II	1000	2292.86	V III	200	2301.0	As IV
100	2273.30	Cr III	840	2283.67	Os I	2	2293.0	Ge IV	100	2301.18	Th III
	2273.5	Be II	2	2283.75	In I	12	2293.03	Ar III	300	2301.40	Co II
100	2273.71	Sr III	700	2283.93	Cl III	10	2293.06	Fe III	160	2301.47	Ta II
350	2273.83	Cs II	100	2283.99	Yb III	30	2293.14	Ne IV	8	2301.49	Pb V
80	2273.92	Nb III	150	2284.086	Fe I	110	2293.32	O II	100	2301.60	Zr III
280	2274.38	Pt I	200	2284.22	Po	300 d	2293.38	Co II	50	2301.684	Fe I
2100	2274.62	Re I	10000	2284.34	Y III	150 r	2293.44	Sb I	20	2302.06	Hg I
100	2275.23	Nb III	80	2284.40	Nb III	400 h	2293.44	Br III	20	2302.065	Hg I
5200 c	2275.25	Re II	150	2284.44	Cr III	250	2293.49	Ne IV	280	2302.08	Nb II
80	2275.43	Cr III	330	2284.60	Ir I	2500 r	2293.84	Cu I	4000	2302.09	Ce III
6	2275.46	Ca I	10 w	2284.62	Pr III	2	2294.19	Ga I	15	2302.17	Ar III
50	2275.47	Mo III	360	2284.79	Tm II	170	2294.368	Cu II	440	2302.24	Ta II
50	2275.64	Mo III	30 d	2284.89	O II	80	2294.41	Fe I	2	2302.49	In I
150	2276.026	Fe I	160	2284.91	W I	2700	2294.49	Re I	290	2302.54	Ru I
150	2276.21	Rh II	130	2285.02	Ta II	530 d	2294.49	W I		2302.57	Li II
200	2276.258	Cu II	350	2285.17	Br II		2294.54	W II	140	2302.73	Ti I
100	2276.38	Cr III	320	2285.17	W I	500	2294.73	Tm III	440	2302.93	Ta II
12	2276.52	Ca III	790	2285.25	Ta II	200	2294.97	Mo III	610	2302.99	Re I
340	2276.58	Bi I	170	2285.38	Ru I	330	2295.08	Ir I	1000	2303.00	Ni II
10	2276.66	Pb V	50	2285.45	Tc I	160	2295.18	Ta	55	2303.06	Si I
130	2276.70	Ti I	13	2285.66	Na III	6	2295.48	Si III	1000	2303.12	Cu I
20	2276.85	Eu III	550	2285.79	Ne IV	60	2295.55	Cr III		2303.33	Li II
1000	2276.91	Tm III	1000	2286.15	Co II	370	2295.68	Nb II	100	2303.424	Fe I
95	2276.94	Lu II	100	2286.50	Ag III	15	2295.86	Fe III	300	2303.49	Ta II
620	2277.16	Hf II	200	2286.57	Tm III	20000	2296.21	Tm III	80	2303.58	Na II
5	2277.25	C V	600	2286.59	Ta II	200 r	2296.53	Pd II	150	2303.581	Fe I
800	2277.28	Ni II	100	2286.645	Cu II	400	2296.55	Ni II	1200	2303.72	Gd III
80	2277.47	Cr III	10000	2286.67	Zr IV	5	2296.81	Th IV	240	2303.83	W II
25	2277.52	Au II	25	2286.68	Cs II	800	2296.87	C III	500	2304.14	Rb III
510	2277.58	W I	200 r	2286.68	Sn I	10	2296.87	Si III	2700	2304.22	Ir I
600	2277.65	Er III	160	2286.69	N II	1000	2296.89	Gd IV	1400	2304.24	Ba II
50	2277.87	Sr III		2286.82	Li II	400	2297.14	Ni II	160	2304.25	Mo II
20	2277.92	C V	500	2286.82	Rb II	380	2297.31	Os I	80	2304.26	Mo III
240	2278.19	Ru I	5 h	2287.04	Si IV	190	2297.41	Lu II	20	2304.37	Eu III
5	2278.20	In I	400	2287.21	Tm III	200	2297.43	Tm III	150	2304.45	Rb III
400	2278.32	Ni II	150	2287.250	Fe I	250	2297.74	La III		2304.59	Li I
500	2278.34	Cl III	240	2287.27	Ta II	200	2297.787	Fe I	100	2304.64	Tm III
15	2278.42	Na III	50 h	2287.50	Pt II	1	2297.87	Ga I	45	2304.69	Au II
800	2278.77	Ni II	2900	2287.51	Re I	30	2298.04	Tl II	60	2304.78	Nb III
10	2279.10	Ar III	3	2287.6	Tl I	790	2298.05	Ir I	400	2304.82	Tm III
80	2279.36	Nb III	350	2287.60	Br II	100	2298.08	Tc I		2304.92	Li I
780	2279.57	Ru I	500	2287.65	Ni II	390	2298.09	Re II	5000	2305.03	Tm III
200	2279.85	Ta I	2000	2287.82	Ce III		2298.16	Ir I	300	2305.32	Yb III
80	2279.937	Fe I	1500 r	2288.022	Cd I	600	2298.169	Fe I		2305.36	Li I
190	2279.96	Ti I	350 r	2288.12	As I	50	2298.29	F IV	410	2305.47	Ir I
660	2280.00	Ir I	30	2288.20	Pt II	2	2298.33	In I	190	2305.67	Ti I
75	2280.03	Ag II	110	2288.44	N II	270	2298.33	W I		2305.83	Li I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
100 c	2306.05	In II	1100	2313.50	Gd III		2319.18	Li I	100	2326.	Bi IV
	2306.29	Li I	70	2313.53	Al I	220	2319.19	Re I	290	2326.09	W II
300 r	2306.46	Sb I	1700	2313.56	Gd III	10	2319.22	Fe III	100	2326.10	Pt I
680	2306.54	Re I	1400	2313.66	Ni I	10	2319.37	Ar III	200 d	2326.11	Co II
240	2306.59	W I	190	2313.75	Os II	10 w	2319.40	Pr III	5000	2326.19	Tm III
	2306.82	Li I	1400	2313.98	Ni I	200	2319.44	La II	500	2326.47	Co II
25	2306.86	In I	500	2314.05	Co II	100	2319.52	Th III	140	2326.47	Rh I
160	2306.97	Mo II	7	2314.15	Hg III	20 d	2319.66	V V	390 d	2326.56	W I
1500	2307.03	Gd III	220	2314.17	W I	50 d	2319.68	O II		2326.70	W I
210	2307.27	Ir I	10	2314.18	Pr III	500	2319.75	Ni II	50	2326.75	Mo III
1000	2307.40	Br IV	400	2314.18	V III	3	2319.92	Y III	100	2326.926	Th II
	2307.44	Li I	18	2314.201	Ge I	2600	2320.03	Ni I	10	2326.95	Fe III
10	2307.59	Pr III	200	2314.49	Yb III	370	2320.16	Re I	330	2326.99	Os I
25	2307.71	Cs II	25	2314.55	Au II	550	2320.18	Os I	100	2327.02	Tm III
10	2307.77	Pr III	80	2314.63	Cr III	80 r	2320.29	Ag II	10	2327.02	Ti III
800 d	2307.85	Co II	200	2314.88	Tm III	200	2320.358	Fe I	300	2327.25	Tm III
240	2308.04	Pt I	50	2314.95	Sr III	10	2320.41	Pr III	10000	2327.31	Y III
75	2308.12	Zr III	300	2314.96	Co II	140	2320.81	Yb II	100	2327.40	Fe II
10	2308.19	Si III	190	2315.02	W II	500	2320.96	Tm III	10	2327.69	Eu III
660	2308.31	Os I		2315.08	Li I	200	2321.07	Cd II	15	2327.88	Fe II
10	2308.41	Pr III	1000	2315.09	Gd III	130	2321.07	Cs II	24	2327.918	Ge I
100	2308.46	Ta II	2	2315.09	In I	230	2321.14	Hf II	70 d	2327.95	In II
910	2308.93	Ir I	460	2315.38	Ir I	1900	2321.38	Ni I	210	2327.98	Ir I
	2308.97	Li I	10 w	2315.46	Pr III	410	2321.45	Ir I	75	2328.31	W II
120	2308.999	Fe I	420	2315.46	Ta II	140	2321.56	Al I	6000	2328.50	Tm III
2600	2309.02	Co I	90	2315.50	Pt I	410	2321.58	Ir I	10 w	2328.56	Pr III
340	2309.02	W I	300	2315.65	Na II	460	2321.63	W I	2 h	2328.56	Si IV
100	2309.19	Er III	40	2315.68	Cs II	10 p	2321.71	Fe III	80	2328.64	Rh I
100	2309.27	Yb III	20	2315.75	Au II	95	2321.73	Rh I	300	2328.66	Re I
3	2309.32	In I	150	2315.89	Sb I		2321.88	Li I	40	2328.67	B II
2	2309.38	I III	2000	2315.89	La IV	150	2322.01	Ru I		2329.02	Li I
30 h	2309.56	Ag I	140	2315.98	Tl I	30 d	2322.15	O II	6000	2329.29	Tm III
2	2309.75	In I	1000	2316.04	Ni II	300	2322.27	Au III	3	2329.3	Kr IV
110	2309.82	Rh I	30 d	2316.12	O II	580	2322.47	Hf II	1900	2329.35	Gd III
	2309.88	Li I	220	2316.49	N II	800	2322.49	Re I	3	2329.58	Mg II
50	2309.92	Nb III	160	2316.69	N II	350	2322.58	Rh I	120	2329.77	Tm II
50	2309.99	Cr III	30 d	2316.79	O II	240	2322.68	Ni I		2329.84	Li II
15	2309.99	Na III	100	2316.85	Cr IV	200	2322.83	Tm III	940	2329.96	Ni I
700	2310.04	Ag III		2316.95	Li I	40	2323.03	B II	50	2330.22	Nb III
30	2310.33	Sr III	9	2317.00	Ar III	1400	2323.12	Gd III	2500	2330.42	V III
	2310.94	Li I	285	2317.05	N II	2400	2323.14	Co I	240	2330.46	Mo I
2000	2310.96	Ni I	70 r	2317.05	Ag II	1700	2323.18	Gd III	200	2330.87	Tm III
50	2310.96	Pt II	200 p	2317.06	Co II	15	2323.20	Hg I	150	2330.93	Mo III
100	2311.	Bi IV	1400	2317.16	Ni I	300	2323.25	Hf II	60	2331.10	Ba III
20000	2311.16	Tm III	600 r	2317.23	Sn I	30	2323.40	In II	100	2331.29	Ta II
10	2311.29	Pr III	500 h	2317.30	Br II	600	2323.50	Cl III	100	2331.31	Fe II
10	2311.44	Pr III	5000	2317.34	Ce III	35	2323.51	Ba III	15	2331.35	Ti III
2500 r	2311.47	Sb I	400	2317.35	Tm III	100	2323.71	Tm III	140	2331.36	Yb IV
500	2311.60	Co II	15	2317.47	Ar III	100	2323.77	Tm III	80 r	2331.40	Ag II
10	2311.92	Eu III	90	2317.48	Al I	2200	2323.78	Gd III	15	2331.66	Ti III
15	2312.08	Ca III	10 p	2317.70	Fe III	500	2323.82	V III	500	2331.75	V III
	2312.11	Li I	480	2317.80	Ru I	310	2323.98	Os I	3000	2331.80	Tm III
1700	2312.34	Ni I	12	2318.04	Ar III	40	2324.06	Cr IV	15	2331.97	Fe II
250	2312.46	Rb III	500	2318.06	V III	660	2324.24	Os I	690	2331.98	Ta II
60	2312.49	Al I	90 w	2318.09	N IV	5000	2324.31	Ce III	110	2332.12	Mo II
10 h	2312.60	Ag I	10	2318.15	Pr III	300 p	2324.31	Co II	550	2332.19	Ta II
440	2312.60	Ta II	220	2318.29	Pt I	5	2324.41	In I	150	2332.418	Pb I
5000	2312.72	Tm III	10	2318.36	Pr III	100	2324.43	Tm III	1000	2332.54	Tb IV
1000	2312.77	Cd II	55	2318.36	Rh I	120	2324.50	Hf II	3	2332.76	In I
230	2312.97	Re I	10000	2318.64	Ce III		2324.6	Be II	150	2332.8	Se I
30 d	2313.05	O II	10	2318.64	Pr III	500	2324.62	Tm III	300	2332.80	Fe II
150	2313.104	Fe I	10	2318.82	Pr III	70 r	2324.68	Ag II	200	2332.97	Hf II
440	2313.17	W I	10	2318.97	Pr III	80	2324.68	Th III	250	2333.01	Rb II
90 d	2313.21	In II	400	2319.00	V III	150	2324.88	Cr III	540	2333.30	Ir I
300	2313.29	Br III	60	2319.06	Al I	300	2324.89	Hf II	2000	2333.39	Rb II
100	2313.30	Nb III	100	2319.07	Cr III	3	2324.92	In I	130	2333.77	W II
220	2313.34	Re I	95	2319.10	Rh I		2325.11	Li I	740	2333.84	Ir I
200 h	2313.44	Hf III	10	2319.13	Ar III	1400	2325.79	Ni I		2333.94	Li I
	2313.49	Li I	260	2319.16	Ta II	130	2325.94	Mo I	110	2334.13	Ta II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
400	2334.20	V III	600	2340.64	Cl III	100	2349.81	Rb III	280	2357.10	Pt I
270	2334.33	Re I	290	2340.69	Os I	350 r	2349.84	As I	30 h	2357.18	Si II
15	2334.34	Ti III	240	2340.69	Ru I	5000	2350.10	Ce III	240	2357.25	Os I
30	2334.40	Si II	4	2340.84	I IV	20	2350.17	Si II	250	2357.30	Ta I
200 c	2334.46	Pr IV	3	2340.85	I III	230	2350.23	Os II	20	2357.34	Sr IV
580	2334.50	Ir I	70	2340.92	Tm II	120 d	2350.37	W II	230	2357.53	Ir II
10	2334.56	Eu III	200	2340.94	Ta II	10	2350.38	Eu III	25	2357.85	Cs II
310	2334.56	Os I	500	2341.20	Ni II	3	2350.43	I III	10	2357.87	Eu III
80 h	2334.57	In II	210	2341.37	W I	220 d	2350.46	Re I	20	2357.90	Sn I
500	2334.58	Ni II	190	2341.59	Mo II	200	2350.51	Eu III	170	2357.91	Ru II
30	2334.61	Si II	200	2341.61	Ta II	20	2350.66	Be I	70	2357.92	Ag II
190	2334.77	Rh II	500	2341.74	Tm III	60	2350.71	Be I	700	2357.96	Ne IV
50	2334.79	Sr III	100	2341.90	Rb III	50 d	2350.75	In II	50 h	2357.97	Si II
300 r	2334.80	Sn I	300	2342.04	Tm III	200	2350.83	Be I	300	2358.04	Rb II
180	2334.88	Ta II	2100	2342.74	Gd III	250	2350.84	Ne IV	410	2358.16	Ir I
120	2334.96	Ru II	190 h	2342.85	Ru II	50	2351.20	Fe II	3	2358.5	Kr IV
2100	2335.01	Gd III	10	2343.10	Eu III	540	2351.22	Hf II	110	2358.51	Er II
400	2335.01	Tm III	500	2343.10	V III	50	2351.32	Pd II	40	2358.69	Er III
2000	2335.27	Ba II	80	2343.13	Cs II	310	2351.33	Ru I	5	2358.70	In I
150	2335.50	Th III	1600	2343.18	Ir I	7	2351.67	Ar III	500	2358.73	V III
270	2335.73	Re I	230	2343.32	Hf II	15	2351.67	Fe II	10	2358.79	Er III
140	2335.75	Ta II	2	2343.37	Ge IV	90	2351.99	Ta II	60	2358.81	W II
1400	2335.99	Co I	600	2343.49	Fe II	680	2352.07	Re I		2358.93	Li I
1600	2336.02	Gd III	740	2343.61	Ir I	10	2352.28	Eu III	10	2359.08	Eu III
220	2336.10	Re I	130	2343.64	Ta II	25	2352.31	Fe II	200	2359.12	Fe II
10 w	2336.13	Pr III	430	2343.74	Os I	55	2352.47	Rh I	10	2359.14	Ti IV
500	2336.45	Cl III	80	2343.96	Fe II	20	2352.48	Hg I	170	2359.16	Ta II
300	2336.47	Hf III	80	2344.12	Nb III	450	2352.52	Ne IV	55	2359.18	Rh I
4	2336.75	Kr IV	10	2344.20	Si II	80	2352.61	Mo I	15	2359.233	Ge I
10 p	2336.77	Fe III	150	2344.28	Fe II	100	2352.62	Ir I	2800	2359.31	Gd III
720	2336.80	Os II	100	2344.59	Tm III	180	2352.65	Au I	50	2359.33	Er III
3	2336.88	Li II	250	2344.61	Po I	1000	2352.66	Gd IV	10	2359.50	Ti IV
5	2336.91	Li II	860	2344.78	Re I	1600	2352.85	Co I	16	2359.53	Pb IV
400	2336.93	Br II	25	2344.98	Fe II	360	2352.99	Os I	15	2359.59	Fe II
200	2336.94	Zr V	9	2345.17	Ar III	110	2353.02	Hf I	600	2359.67	Cl III
10	2336.96	Eu III	50	2345.34	Fe II	20 h	2353.09	Si II	100	2359.76	Mo III
	2337.0	Be I	200	2345.37	Rb III	400	2353.10	Tm III	150	2360.00	Fe II
2	2337.00	Li II	55	2345.41	Rh I	350	2353.11	Rb II	10 h	2360.20	Si II
200	2337.07	Rb III	20	2345.43	Hg I	200 d	2353.41	Co II	9	2360.26	Ar III
200	2337.33	Hf II	20	2345.440	Hg I	2000	2353.42	Co I	120	2360.29	Fe II
460	2337.49	Ni I	1200	2345.54	Ni I	2	2353.46	I III	3	2360.34	Sn II
2000	2337.66	Ce III	500	2345.61	Tm III	30	2353.47	Fe II	50	2360.40	Cr IV
160	2337.82	Ni I	260	2345.75	Os I	15	2353.68	Fe II	580	2360.44	W I
270	2337.95	Re I	8	2345.90	In I	170	2353.86	Ta II	30	2360.51	Fe II
200	2337.97	Yb III	100	2346.42	Ta II	210 d	2353.95	Re I	140	2360.56	Ru I
200	2338.01	Fe II	2500	2346.52	Gd III	300	2353.96	Rb II	160	2360.63	Ni I
100	2338.09	Nb III	5	2346.56	In I	50	2354.20	Y I	10	2360.65	Eu III
3	2338.24	Ga I	190	2346.63	Ni I	130	2354.44	Cs II	500	2360.73	Ir I
300	2338.28	Ta II	18	2346.79	Ti III	50	2354.48	Fe II	1900	2360.87	Gd III
1000	2338.36	Tm III	10	2346.83	Eu III	320	2354.61	W I	40	2361.08	Yb III
1	2338.60	Ga I	50	2346.97	Sr IV	1000 r	2354.84	Sn I	260	2361.09	Ta I
430	2338.63	Os I	430	2347.38	Os I	40	2354.89	Fe II	7	2361.13	I IV
1600	2338.67	Co I	200	2347.39	Co II	580	2355.00	Ir I	1000	2361.23	Tm III
10	2338.96	Fe III	300	2347.43	Tm III	80	2355.22	Mo I	2300	2361.91	Gd III
1900	2338.97	Gd III	320	2347.44	Hf II	120	2355.22	Ta II	300	2361.92	Rh I
17	2339.00	Ti III	400	2347.52	Ni I	120	2355.28	Os II	40	2362.02	Fe II
200 c	2339.08	Pr IV	190	2347.58	Ba II	750	2355.31	La IV	200	2362.06	Ni I
30 d	2339.31	O II	10	2347.64	Eu III	80	2355.42	Mo II	100	2362.06	Nb III
10	2339.84	Eu III	200	2348.11	Fe II	150 h	2355.48	Hf III	50	2362.31	Pd II
1600	2339.88	Gd III		2348.22	Li I	80	2355.54	Nb III	1400	2362.38	Gd III
25	2340.06	Au II	4	2348.27	Kr IV	100	2355.65	Tm III	310	2362.41	Os I
100	2340.13	Sr III	250	2348.30	Fe II	170	2356.05	Ta II	80	2362.50	Nb III
	2340.15	Li I	750	2348.36	La IV	100 h	2356.30	Si II	2000	2362.54	Ce III
170	2340.18	Pt I	950	2348.61	Be I	250	2356.50	Re I	250	2362.68	Ne IV
10	2340.19	In I	90	2349.21	Nb III	140	2356.90	Ta II	900	2362.77	Os I
190	2340.47	Mo I	75	2349.26	W II	260	2356.91	Dy II	160	2362.78	Ta II
60	2340.51	Cr III	190	2349.34	Ru I	240	2356.92	Os I	50	2362.89	Yb II
5	2340.57	Hg I	230	2349.39	Re I	400	2356.97	Rb II	2500	2363.04	Ir I
100	2340.58	Th III	10 h	2349.54	Si II	3000	2357.05	Tm III	100	2363.06	Th III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
850	2363.07	W I	30	2369.99	Yb III	10	2376.42	Eu III	1000	2382.04	Fe II
2100	2363.26	Gd III	170	2370.17	Ru I	120	2376.43	Fe II	3000	2382.28	Ce III
250	2363.28	Ne IV	140	2370.22	Al I	7	2376.46	I IV	100	2382.40	Au III
130	2363.32	Ta II	600	2370.37	Cl III	4	2376.47	I III	1000	2382.46	V III
20	2363.76	Eu III	25	2370.50	Fe II	40	2376.82	Cd II	110 d	2382.63	In II
500	2363.80	Co II	500	2370.70	Os I	2600	2377.03	Os I	270	2382.89	Rh I
60	2363.86	Fe II	70	2370.73	Al I	5000	2377.07	Ce III	20	2382.90	Fe II
120	2363.91	Tm II	220	2370.76	Re II	10	2377.07	Er III	210	2382.99	W I
500	2363.97	Tm III	300	2370.76	Ta II	20	2377.22	Yb III	20	2383.06	Fe II
60	2364.22	W II	100 r	2370.77	As I	20	2377.23	Eu III	210	2383.17	Ir I
600	2364.24	Ta II	3	2370.99	Si IV	250	2377.28	Ir I		2383.20	Li II
300	2364.27	Rb II	2500	2371.06	V III	50	2377.28	Pt II	60	2383.25	Fe II
200	2364.32	Rb II	480	2371.18	Os I	5000	2377.48	Ce III	1200	2383.26	Te I
70	2364.37	Mo I	3	2371.29	Ga I	2	2377.53	Ga II	130	2383.33	Cr I
80 h	2364.71	Cr I	100	2371.42	Th III	120	2377.57	Hf III	230	2383.40	Rh I
130	2364.81	Cs II	120	2371.430	Fe I	260	2377.61	Os I	300 p	2383.45	Co II
200	2364.83	Fe II	2	2371.45	I III	190	2377.84	Th II	150	2383.52	Mo I
200	2365.15	Rb II	210	2371.52	Re I	250	2377.98	Ir I	250	2383.540	Hf III
1600	2365.22	Gd III	320	2371.58	Ta I	10 w	2378.06	Pr III	10	2383.62	Eu III
200	2365.32	Re I	160	2372.07	Al I	20	2378.13	Fe II	300 h	2383.64	Sb I
200	2365.43	Yb III	350	2372.16	Ne IV	15	2378.14	In I	130	2383.64	Pt I
110	2365.49	Ne IV	60	2372.16	Pd II	150	2378.31	Ta II	150	2383.68	Tm II
10	2365.52	Pr III	140	2372.27	Mo I	100	2378.32	Hg I	170	2383.72	Ta II
80	2365.70	Nb III	10000	2372.34	Ce III	100	2378.325	Hg I	40	2384.00	V II
80	2365.76	Fe II	6	2372.45	I IV	60	2378.40	Al I	60	2384.17	Zr I
1200	2365.90	Re I	3	2372.45	I III	75	2378.53	Re II	65	2384.20	Ne IV
45	2365.96	Tm II	100	2372.73	Nb III	400	2378.62	Co II	240	2384.28	Ta II
90	2365.98	Hf II	3500	2372.77	Ir I	10 w	2378.97	Pr III	40	2384.28	V I
50	2366.09	Mo II	20	2373.06	Te II	2000 c	2378.98	Pr IV	50	2384.39	Fe II
500	2366.31	V III	850	2373.12	Al I	10	2379.00	In I	35	2384.52	Ti I
25	2366.59	Fe II	200	2373.21	Rb II	20	2379.144	Ge I	4	2384.54	Sn II
2	2366.76	Si IV	100	2373.30	Hf III	800	2379.17	Gd IV	240	2384.62	Os I
30	2366.97	Si II	170	2373.35	Al I	80	2379.27	Fe II	40	2384.65	Rh I
460	2367.05	Al I	20	2373.36	Mn II	400	2379.37	La III	670	2384.82	W I
160	2367.11	Tm II	2000	2373.38	Gd III	500	2379.38	Ir I	1400	2384.86	Co I
50000	2367.23	Y III	150	2373.48	Re II	900	2379.39	Os I	350	2384.95	Ne IV
50	2367.24	Ta II		2373.54	Li I	20	2379.41	Fe II	3000	2385.06	Ce III
500	2367.35	Os II	110	2373.57	Al I	1000 c	2379.66	Pr IV	50	2385.24	Y
50	2367.46	Yb III	300	2373.624	Fe I	900 h	2379.69	Tl I	4	2385.28	I IV
300	2367.51	Rb II	400 h	2373.67	Sb I	370	2379.77	Re I	2000	2385.34	Rb II
110	2367.61	Al I	150	2373.74	Fe II	20	2380.00	Hg I	7	2385.40	He II
200	2367.64	Er III	30	2373.83	Y	20	2380.004	Hg I	900	2385.65	Gd IV
570	2367.68	Re I	100	2373.94	Ta II	10000	2380.12	Ce III	130	2385.73	Ta I
4	2367.74	I III	20	2374.08	Eu III	40	2380.20	Fe II	1500	2385.78	Te I
5	2367.75	I IV	20	2374.26	Si II	250	2380.30	Hf II	270	2386.14	Rh II
2000	2367.77	Ce III	1300	2374.29	Gd III	100	2380.41	Mo I	200	2386.36	Co II
75	2367.92	Pd II	60	2374.42	Zr I	150	2380.44	Rb III	350	2386.45	Br II
20	2368.04	Eu III	510	2374.47	W I	1400	2380.48	Co I	100	2386.58	Er II
370	2368.04	Ir II	120	2374.518	Fe I	4	2380.55	Hg III	120	2386.58	Ir II
110	2368.11	Al I	30	2374.84	Rh III	60	2380.72	Sn I	240	2386.58	Ni I
16	2368.12	Bi II	18	2374.99	Ti III	120	2380.76	Fe II	500	2386.70	Br II
500	2368.17	Cu III	50 h	2375.02	Ag I	65	2380.81	Ti I	40	2386.81	Pt I
12	2368.25	Bi II	95	2375.06	Os II	100	2381.00	Hf II	100	2386.85	Ag III
180	2368.28	Pt I	320	2375.07	Re I	440	2381.13	Ta II	1300	2386.89	Ir I
22	2368.33	Sn II	290	2375.09	Ir II	135 r	2381.18	As I	180	2386.90	Re II
110	2368.34	Rh I	60	2375.19	Fe II	80	2381.25	Er III	80	2386.96	Mo III
180	2368.53	Re II	10	2375.20	Eu III	100	2381.29	Rb III	60	2386.96	V I
80	2368.59	Fe II	240	2375.27	Ru I	1300	2381.38	Gd III	18	2386.99	Na III
10	2368.78	Pr III	1000	2375.32	Tm III	20	2381.40	Er III	20	2387.0	S IV
50	2368.91	Th III	1000	2375.42	Ni II	80	2381.47	Th III	1400	2387.06	Ta II
10	2369.08	Pr III	4000	2375.46	Eu III	240	2381.52	Ta II	110	2387.09	Nb II
290	2369.24	Os I	20	2375.50	Er III		2381.54	Li II	8	2387.11	I IV
520	2369.27	Re I	80	2375.63	Ru II	500 c	2381.59	Lu III	4	2387.12	I III
180	2369.30	Al I	700	2375.83	Tm III	540	2381.62	Ir I	120	2387.17	Er II
150	2369.32	Ta II	70	2375.91	Ta I	40	2381.75	Er III	20	2387.29	Eu III
80	2369.456	Fe I	100	2376.	Bi IV	200	2381.76	Co II	1700	2387.29	Os I
8	2369.73	Ra II	500 c	2376.09	Pr IV	10	2381.81	Eu III	130	2387.36	Dy II
150	2369.890	Cu II	20	2376.28	Au I	150	2381.835	Fe I	100	2387.41	Nb III
80	2369.95	Fe II	170	2376.40	Nb II	65	2381.95	Dy	140	2387.52	Nb II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
120	2387.75	Au I	700	2393.29	Gd IV	20	2400.05	Fe II	10	2406.14	Eu III
1600	2387.82	Gd III	450	2393.36	Hf II	10	2400.49	Hg I	3000	2406.15	Ce III
20	2387.82	Te II	500	2393.58	V III	2400	2400.63	Ta II	40	2406.21	Zr III
10	2387.99	La III	5	2393.60	Er III	210 d	2400.72	Re I	130	2406.44	Hf II
50	2388.01	Zr I	230	2393.65	Re I	130	2400.78	Hf II	50 h	2406.47	In II
3	2388.05	Kr IV	550 r	2393.792	Pb I	190	2400.88	Bi I	130	2406.55	Ta I
80	2388.23	Nb III	670	2393.83	Hf II		2400.89	Re I	15	2406.59	Na III
45	2388.27	Nb II	1200	2393.86	Gd III	20	2401.00	Eu III	4000	2406.63	Tm III
50	2388.29	Pd II	40	2393.94	Kr III	100	2401.01	Na II	1500	2406.66	Cu I
40	2388.37	Fe II	17	2394.03	Na III	960	2401.13	Os I	250	2406.66	Fe II
80	2388.37	Ta II	330	2394.29	Os I	15	2401.29	Fe II	320	2406.70	Re I
340	2388.57	Re I	80	2394.33	O III	10	2401.63	Te II	120	2406.75	V I
300	2388.63	Fe II	320	2394.37	Re I	210	2401.68	Re I	80	2406.97	Fe II
300	2388.69	Br II	1	2394.39	Li I	70	2401.87	Pt I	2000 c	2407.10	La IV
2000	2388.77	Gd III	1000	2394.52	Ni II	320 r	2401.940	Pb I	5300	2407.25	Co I
180	2388.797	Pb I	10	2394.66	Eu III	1100 d	2402.06	Co I	20	2407.30	Eu III
500	2388.92	Co II	5000	2395.04	Ce III	140	2402.13	Ta II	60	2407.35	Hg II
60	2388.92	V I	220	2395.05	B II	260	2402.23	Os I	230	2407.59	Ir I
110	2388.95	Tm II	20	2395.15	Mg III	180	2402.29	Dy II	80	2407.88	Rh I
450	2388.96	Br II	100	2395.22	Sb I		2402.33	Li II	110	2407.90	V I
240	2389.08	W I	290	2395.39	Os I	20	2402.34	Eu III	150	2407.92	Ru II
20	2389.11	Eu III	40	2395.42	Fe II	700	2402.70	Gd IV	100	2408.01	I II
160	2389.11	Ta II	10	2395.44	Pr III	150	2402.71	Au III	4000	2408.08	Ce III
110	2389.20	Mo II	20	2395.62	Eu III	780	2402.72	Ru II	100	2408.15	Sn I
50	2389.21	Zr I	1000	2395.62	Fe II	2	2402.75	Er III	1000	2408.16	Br IV
10	2389.472	Ge I	10	2395.63	Ar III	75	2403.04	Re II	10	2408.19	Pr III
400	2389.52	Tm III	300	2395.69	Ag III	4	2403.05	I IV	27	2408.19	Rh I
8	2389.53	Fe III	700	2395.76	Gd IV	2	2403.06	I III	130	2408.26	Ta II
120	2389.53	Pt I	1100	2395.88	Os I	200	2403.09	Pt I	20	2408.32	Eu III
40	2389.54	In I	35	2396.17	Pt I	120	2403.337	Cu II	40	2408.39	Mo I
500	2389.69	Br II	500	2396.22	Gd IV	200	2403.54	Os I	1300	2408.41	Gd III
200	2389.973	Fe I	600	2396.27	Gd IV	140	2403.61	Mo II	140	2408.62	Cr I
10	2389.98	Eu III	70	2396.30	Ta I	50	2403.61	Mo III	360	2408.67	Os I
500	2390.07	Gd IV	110	2396.38	Er III	2	2403.63	I III	50	2408.76	In II
30	2390.10	Fe II	250	2396.40	Er III	100	2403.68	Ta II	450	2409.02	Tm II
120	2390.37	W II	95	2396.71	Ru II	330	2403.85	Os I	1200	2409.35	Gd III
200 d	2390.44	O III	15	2396.72	Fe II	50	2403.95	Yb III	290	2409.37	Ir I
2500	2390.62	Ir I	220	2396.78	Os I	20	2404.08	Eu III	10	2409.63	Eu III
170	2390.74	Yb II	320	2396.79	Re I	200 p	2404.16	Co II	10	2409.80	Pr III
20	2390.77	Fe II	730	2397.09	W II	50	2404.17	Sr III	240	2410.01	Dy II
75	2390.87	V I	200	2397.31	Re I	500	2404.18	V III	20	2410.04	Yb III
20	2391.11	Eu III	1200	2397.34	Gd III	50	2404.23	Nb III	20	2410.08	Eu III
2700	2391.18	Ir I	200	2397.38	Co II	75	2404.24	W II	370	2410.14	Hf II
75	2391.26	V I	560	2397.73	W I	50	2404.43	Fe II	290	2410.17	Ir I
15	2391.48	Fe II	70	2397.78	V I	90	2404.504	Th II	27	2410.25	Rh I
100	2391.48	Th III	1400	2397.87	Gd IV	70	2404.56	Hf II	2000	2410.26	Ce III
400	2391.74	Cu III	15	2397.885	Ge I	80	2404.58	Er III	270	2410.37	Re I
20	2391.90	Eu III	560	2397.98	W I	80	2404.66	Mo II	100	2410.47	Er III
6	2391.96	Er III	18	2398.02	Yb II	800	2404.88	Fe II	300	2410.52	Fe II
6	2392.00	I IV	70	2398.27	V I	80	2404.89	Nb III	30	2410.52	Sr III
3	2392.01	I III	160	2398.48	Nb II	1200	2405.03	Gd III	290	2410.73	Ir I
150	2392.15	Dy	8	2398.56	Ca I	1500	2405.06	Re I		2410.84	Li II
1300	2392.19	Lu II	20	2398.79	Eu III	95	2405.08	Os II	55	2410.89	Ru I
350	2392.21	Br II	40	2398.9	S IV	150	2405.12	Au III	240	2410.98	Os I
700	2392.30	Gd IV	10	2398.91	Er III	70	2405.15	Cr IV	200	2411.07	Fe II
400	2392.42	Br II	110	2399.00	Al III	55	2405.34	Nb II	75	2411.41	Ag II
160	2392.42	Ru I	120	2399.14	Lu II	540	2405.42	Hf II	75	2411.54	W II
20	2392.49	La III	12	2399.15	Ar III	290	2405.45	Os I	1000	2411.58	Br IV
20	2392.58	Fe II	110	2399.15	Ta I	800	2405.50	Cu III	110	2411.60	O II
10	2392.59	Eu III	10	2399.18	In I	45	2405.52	Zr I	5300	2411.62	Co I
2500 r	2392.63	Cu I	300	2399.24	Fe II	10 w	2405.56	Pr III	320 r	2411.734	Pb I
250	2392.86	Cs II	40	2399.349	Hg I	1700 d	2405.58	W I	50	2411.81	Fe II
85	2392.90	V I	40	2399.38	Hg I	740	2405.60	Re I	40	2412.02	Eu III
120	2392.93	W II	140	2399.597	Pb I		2405.69	W I	500	2412.21	Gd IV
60	2393.08	Er III	10	2399.70	Pr III	35	2405.81	Zr III	60	2412.33	Yb III
170	2393.18	Hf II	20	2399.729	Hg I	55	2405.85	Nb II	700	2412.34	Cu III
40	2393.18	In II	20	2399.73	Hg I	140	2405.86	Mo I	10	2412.40	Pr III
40	2393.20	B II	50	2399.92	Ta II	250	2405.94	Rb II	110	2412.44	Tm II
130	2393.28	Na II	70	2399.96	V I	200	2405.96	Os I	140	2412.46	Nb II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
70	2412.71	Mo III	7	2418.24	Cd III	40	2423.21	Fe II	3	2428.04	Kr IV
300	2412.73	Ne III	55	2418.36	Ti I	50	2423.23	Tc I	80	2428.04	Pt I
1600	2412.76	Co I	15	2418.44	Fe II	60	2423.32	Cr IV	160	2428.10	Sr I
40	2412.84	Mo II	2	2418.45	I IV	70	2423.33	Ni I	500 c	2428.13	Pr IV
240	2412.94	Ne III	150	2418.46	Rb III	170	2423.48	Ta II	50	2428.20	Pt I
20	2412.96	Eu III	2	2418.49	I III	12	2423.52	Ar III	40	2428.23	Ti I
120	2413.01	Mo II	530	2418.53	Os I	70	2423.66	Ni I	110	2428.28	V I
10	2413.20	Ar III	55	2418.64	Rh	60	2423.84	Re II	30	2428.29	Fe II
90 r	2413.23	Ag II	50	2418.69	Cd II	3	2423.89	I IV	120	2428.36	Fe II
20	2413.26	Eu III	4	2418.69	Ga I	2	2423.91	I III	10 h	2428.45	Si II
540	2413.31	Ir I	140	2418.69	Nb II	12	2423.93	Ar III	2500	2428.58	Re I
150	2413.31	Fe II	75	2418.72	Pd II	75	2423.94	Rh	3000	2428.64	Ce III
90	2413.33	Hf II	150	2418.77	Ta II	90	2423.98	Ga III	45	2428.75	Hf I
2	2413.34	Be II	10	2418.82	Ar III	70	2424.00	Mo II	25	2428.80	Fe II
100	2413.409	Th II	2	2418.85	I III	70	2424.02	Os II	120	2428.99	Hf II
10	2413.41	Eu III	10	2418.95	Pr III	70	2424.03	Ni I	25	2429.03	Fe II
16	2413.46	Be II	65	2419.01	Mo II	150	2424.14	Fe II	25	2429.10	Pt I
600	2413.5	Se I	50	2419.06	In II	870	2424.21	W I	65	2429.16	Sc I
200	2413.50	Th III	10	2419.11	Eu III	95	2424.24	Ti I	10	2429.18	Yb III
200	2413.78	Ne III	100	2419.18	I II	120	2424.32	Ir I	40	2429.32	Eu III
25	2413.93	Y II	50	2419.20	In II	15	2424.36	Ga III	20	2429.39	Fe II
100	2413.94	Nb III	80	2419.21	Lu II	15	2424.39	Fe II	170	2429.39	W II
22	2413.99	Ti III	10	2419.25	Eu III	375	2424.40	P V	1000 r	2429.49	Sn I
320	2414.04	W I	900	2419.26	Gd IV	75	2424.49	Pd II	230	2429.52	Rh I
50	2414.13	Hg II	240	2419.31	Ni I	20	2424.54	Tc I	45	2429.60	Ru I
120	2414.32	Ta I	50	2419.34	W II	50	2424.54	Th III	10 d	2429.66	Eu III
4800	2414.46	Co I	60	2419.41	Zr II	500	2424.56	Os I	360	2429.71	Ta II
60	2414.50	Nb III	10	2419.58	Eu III	30	2424.59	Fe II		2429.81	Li II
290	2414.52	Os I	45	2419.75	Rh I	120	2424.66	Ir I	20	2429.86	In I
75 h	2414.6	Bi III	200	2419.81	Er III	300	2424.73	Na II	30	2429.86	Fe II
40000	2414.64	Y III	1200	2419.81	Re I	15	2424.81	Pb V	10	2430.04	Eu III
60	2414.73	Pd II	95	2420.02	Os II	50	2424.87	Pt II	120	2430.08	Fe II
55	2414.82	Ru II	100	2420.12	V I	210	2424.89	Ir I	5000	2430.24	Ce III
2	2414.85	I III	80	2420.18	Mo II	4100	2424.93	Co I	55	2430.26	Lu II
80	2414.89	Cs II	45	2420.18	Rh II	1400	2424.97	Os I	10 w	2430.32	Pr III
240	2415.21	Ta II	60	2420.396	Fe I	370	2424.99	Ir I	65	2430.43	Mo I
4800	2415.30	Co I	5	2420.456	Ar II	10	2425.33	Eu III	100	2430.94	Pd II
70	2415.33	Mo I	75	2420.65	Zr III	3	2425.43	Li I	10	2430.99	In I
120	2415.33	V I	130	2420.82	Ru I	80	2425.55	O II	25	2431.02	Fe II
5000	2415.60	Ce III	65	2420.98	Rh II	290	2425.66	Ir I	170	2431.06	Ta II
7	2415.61	Ar III	300	2420.99	Na II	50	2425.68	Eu III	580	2431.08	W I
610	2415.68	W I	50	2421.01	W II	130	2425.91	Ta II	380	2431.19	Os I
80	2415.84	Rh II	140	2421.03	Ta I	120	2425.98	Hf II	540	2431.24	Ir I
370	2415.86	Ir I	100	2421.06	V I	300	2426.09	Po I	10000	2431.45	Ce III
55	2415.96	Hf II	85	2421.23	Ni I	9	2426.10	I IV	10	2431.49	Eu III
2000	2416.13	Ni II	75	2421.30	Ti I	5	2426.12	I III	40	2431.51	Er III
30	2416.22	Tc I	50 h	2421.32	V IV	10	2426.14	Pr III	490	2431.54	Re I
700	2416.42	Cl III	28	2421.35	Yb II	450	2426.17	Tm II	380	2431.61	Os I
20	2416.45	Fe II	120	2421.65	Tm II	250	2426.35	Sb I	8	2431.65	Hg III
120	2416.75	V I	800 r	2421.70	Sn I	10	2426.36	Cd III	200	2431.68	Th III
320	2416.89	Ta II	250	2421.72	Po I	170	2426.53	Ir II	10	2431.76	Eu III
4	2416.9	Kr IV	300	2421.73	Re I	240	2426.81	Os I	40	2431.85	Rh II
160	2416.99	Nb II	150	2421.85	Ta II	10	2426.85	Pr III	1300	2431.94	Ir I
2000	2417.01	Ce III	300	2421.88	Re I	100	2426.87	Pd II	420	2432.18	Re I
130	2417.367	Ge I	100	2421.91	Nb III	500 c	2427.07	Pr IV	3300	2432.21	Co I
250	2417.5	As IV	100	2421.98	V I	65	2427.11	Rh II	80	2432.26	Fe II
25000 w	2417.58	La IV	30	2422.00	Eu III	70 h	2427.20	In II	170	2432.36	Ir I
16	2417.61	Pb IV	150	2422.13	Sb I	20	2427.38	Mn II	10	2432.55	Eu III
300	2417.65	Co II	50	2422.18	Mo III	190	2427.49	W II	100	2432.58	Ir I
320	2417.69	Hf II	560	2422.20	Y II	540	2427.61	Ir I	40	2432.66	Rh I
10	2417.69	Pr III	200	2422.47	Er III	360	2427.64	Ta I	480	2432.70	Ta II
90	2417.70	Ga III	60	2422.69	Fe II	40	2427.67	Eu III	25	2432.71	Cs II
220	2417.86	Ta II	150	2422.75	Dy II	130	2427.68	Rh I	50	2432.73	In II
80	2417.87	Fe II	80	2422.84	O III	50	2427.72	Mn II	60	2432.87	Fe II
80	2417.96	Mo II	10	2422.90	Eu III	170	2427.79	Cl II	65	2432.93	Ru I
530	2417.99	Os I	55	2422.92	Ru I	70	2427.90	Os II	100	2433.11	Pd II
100	2418.06	Pt I	2000	2423.02	Ce III	30	2427.94	Mn II	35	2433.22	Ti I
620	2418.11	Ir I	200	2423.07	Os II	200	2427.94	Th III	20	2433.43	Yb III
60	2418.20	Re II	60	2423.089	Fe I	2600	2427.95	Au I	3	2433.50	Ce IV

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
1	2433.52	Sn II	80 d	2438.83	O III	300	2445.55	O II	20	2451.24	Eu III
50 h	2433.53	V IV	5	2438.88	Ga II	100	2445.57	Fe II	270	2451.35	W I
250	2433.56	O II	20	2438.93	Sr IV	15	2445.71	Ge IV	780	2451.48	W II
130	2433.57	Hf II	2400	2439.05	Co I	40	2445.80	Fe II	40	2451.58	F IV
130	2433.59	Ta II	200	2439.14	Na II	4000	2445.99	Eu III	4	2451.7	Kr IV
10	2433.65	Eu III	150	2439.30	Fe II	360	2446.02	Os I	10	2451.73	Eu III
75	2433.80	Nb II	20	2439.31	Yb III	200 d	2446.03	Co II	530	2451.73	Os I
630	2433.98	W I	30	2439.433	Th I	150	2446.1	As IV	8	2451.83	Tl II
25	2434.06	Fe II	150	2439.74	Fe I	50	2446.11	Fe II	65	2451.87	Nb II
360	2434.07	Cl II	15000	2439.80	Ce III	150	2446.17	Pd II	870	2452.00	W I
19	2434.10	Ti I	260	2439.84	Dy II	160 r	2446.181	Pb I	10	2452.02	Pr III
400	2434.17	Rb II	500	2439.84	Gd IV	140	2446.39	Er II	120	2452.07	F III
10 w	2434.18	Pr III	200	2439.91	Ta I	160	2446.39	W II	70	2452.12	Si I
10	2434.19	Eu III	650	2440.06	Pt I	30 h	2446.43	Eu III	10	2452.16	Co III
20	2434.24	Fe II	80	2440.11	Fe I	60	2446.45	Nb III	200	2452.18	Na II
10	2434.39	Pr III	35	2440.21	Ti II	30	2446.47	Fe II	35	2452.30	Hf II
20	2434.65	Fe II	10	2440.26	Eu III	75	2446.72	Pd II	100	2452.42	Pd III
50	2434.73	Fe II	65	2440.28	Mo II	10	2446.77	Pr III	30	2452.49	Mn II
45	2434.74	Hf II	330	2440.34	Rh I	50 h	2446.80	V IV	910	2452.81	Ir I
6	2434.85	I IV	600	2440.38	Gd IV	20	2446.90	Hg I	10 w	2452.81	Pr III
3	2434.88	I III	40	2440.42	Fe II	20	2446.900	Hg I	10 w	2452.85	Pr III
50	2434.95	Fe II	20	2440.43	Yb III	610	2446.98	Re I	60	2453.23	In II
60	2435.01	W II	50	2440.67	Eu III	600	2447.14	Cl III	110	2453.34	Hf II
100 d	2435.14	Eu III	450	2440.93	P V	100	2447.17	Ta I	100	2453.476	Fe I
270	2435.14	Ir I	65	2440.98	Ti I	40	2447.20	Fe II	20	2453.84	Be II
300	2435.15	Si I	5	2441.06	Hg I	390	2447.25	Hf II	530	2453.90	Os I
500	2435.31	Tm III	200	2441.24	P V	25	2447.26	Yb II	65	2453.95	Nb II
100	2435.32	Pd II	200	2441.24	Th III	25	2447.33	Fe II	20	2453.98	Fe II
110	2435.52	V I	25	2441.41	Sr IV	30	2447.45	Ru I	85	2453.99	Ni I
20	2435.83	Tc I	340 c	2441.47	Re I	200 p	2447.69	Co II	250	2454.0	As IV
10	2435.91	Pr III	250	2441.50	Na II	60	2447.709	Fe I	50	2454.03	Sr III
40	2435.95	Nb II	3000	2441.55	Ce III	8	2447.71	Ar IV	10000	2454.32	Ce III
65	2435.96	Mo II	1000 r	2441.64	Cu I	30	2447.75	Fe II	100	2454.48	Ta I
1800	2435.96	W I	40	2442.14	Nb II	250	2447.76	Ir I	30	2454.58	Fe II
100	2436.01	Tb IV	30	2442.37	Fe II	100	2447.90	In II	10	2454.60	Pr III
80 d	2436.06	O II	130	2442.39	Ta I	1100	2447.91	Pd I	430	2454.72	W I
35	2436.33	Nb I	230	2442.51	Re I	80	2447.93	Ag II	10	2454.82	Pr III
20	2436.39	Eu III	100	2442.57	Fe I	80	2448.15	Pd II	110	2454.91	Os II
30	2436.412	Ge I	200	2442.63	Co II	10	2448.16	Pr III	65	2454.92	Ru I
10	2436.47	Te II	60	2442.63	In II	190	2448.23	Ir I	630	2454.98	W I
130	2436.51	Ta II	5	2442.68	Kr IV	270	2448.39	W I	200	2454.99	O III
25	2436.62	Fe II	28	2442.68	Nb II	20	2448.57	Eu III	90	2455.15	Dy II
250	2436.62	W I	25	2443.24	Cs II	600	2448.58	Cl III	30	2455.22	Eu III
2900	2436.66	Co I	65	2443.36	Si I	200	2448.72	Na II	60	2455.24	Sn I
180	2436.69	Pt I	7	2443.69	Ar III	65	2448.84	Rh I	780	2455.51	W I
10	2436.77	Eu III	60	2443.71	Fe II	100	2448.86	Zr III	180	2455.53	Ru II
10	2436.89	Pr III	150 r	2443.829	Pb I	15	2448.98	Sn II	1300	2455.61	Ir I
10	2436.99	Tc I	250	2443.872	Fe I	85	2449.03	Re II	500 c	2455.64	Pr IV
110	2437.07	Ta I	1200 p	2443.92	La IV	50	2449.04	Rh I	30	2455.70	Rh II
18	2437.08	Rh I	580	2444.06	W I	200	2449.372	O IV	15	2455.71	Fe II
30	2437.37	Mn II	100	2444.13	Ta II	140	2449.44	Hf II	200	2455.83	Re II
45	2437.42	Nb II	80	2444.26	O II	11	2449.48	Si III	230	2455.87	Ir I
10	2437.6	Bi III	50 h	2444.27	Rh I	85	2449.52	Re II	15	2455.90	Fe II
50	2437.74	Nb III	1000	2444.38	Eu III	6	2449.57	Mg II	150	2456.44	Ru II
100 r	2437.81	Ag II	2000	2444.44	Cu III	610	2449.71	Re I	530	2456.46	Os I
20	2437.84	Mn II	100	2444.51	Fe II	150	2449.85	Zr II	170 r	2456.53	As I
500	2437.89	Ni II	50	2444.58	Zr III	25	2449.96	Fe II	780	2456.53	W I
110	2437.90	Rh I	2000	2444.78	Ce III	200	2450.00	Co II	370	2456.57	Ru II
8	2438.17	Fe III	10 w	2444.93	Pr III	200	2450.040	O IV	50	2456.83	Cr III
60	2438.182	Fe I	250	2444.94	Re I	6	2450.08	Ga I	50	2456.92	F IV
100	2438.27	Yb III	35	2444.99	Hf I	1500 w	2450.08	Po I	100	2456.99	Nb III
500 c	2438.57	Pr IV	50	2445.11	Fe II	25	2450.20	Fe II	210	2457.03	Ir I
110	2438.62	Sc I	50	2445.212	Fe I	24	2450.44	Ti II	15	2457.09	Fe II
10	2438.63	Pr III	250	2445.34	Ir I	75	2450.56	Rh I	210	2457.23	Ir I
110	2438.64	Ta II	15	2445.38	Ge IV	30	2450.58	Ru I	100	2457.29	Pd II
50	2438.69	Te II	140	2445.47	Tm II	20	2450.63	F V	21	2457.44	Zr II
25	2438.70	Zr III	10	2445.49	Pr III	900	2450.74	Os I	1500	2457.598	Fe I
65	2438.77	Si I	5	2445.50	Ce IV	50 h	2450.87	V IV	60	2457.76	Pd II
10	2438.83	Eu III	400 r	2445.51	Sb I	60	2450.97	Pt I	500	2457.86	Tm III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
55	2458.09	Nb II	460	2464.50	Yb I	80	2470.67	Fe II	100	2476.60	La III
65 h	2458.62	Ru I	10	2464.59	Yb III	75	2470.80	W II	60	2476.657	Fe I
10	2458.64	Yb III	60	2464.60	Er III	380	2470.90	Ta II	200	2476.67	Ta II
100	2458.68	Ta I	85	2464.70	Ru I	80	2470.965	Fe I	300	2476.71	Zr IV
150	2458.78	Fe II	100 h	2464.77	Kr II	35	2471.01	Pt I	25	2476.73	Ba III
65	2458.90	Rh II	130	2464.85	F III	75	2471.05	Re II	900	2476.84	Os I
40	2458.97	Fe II	40	2464.90	Fe II	100	2471.18	Pd II	85	2476.87	Ni I
800	2459.14	Rb II	90	2465.06	Hf II	500	2471.23	Tm III	100	2476.88	Ru I
1100	2459.30	W I	120	2465.09	Ir I	120	2471.38	Ta I	5000	2477.25	Ce III
25	2459.31	Na III	20	2465.09	Tc I	90	2471.40	Dy II	25	2477.34	Fe II
130	2459.64	Lu II	800	2465.149	Fe I	90	2471.47	Rh I	110	2477.38	Nb II
40	2459.69	B II	35	2465.67	Hf I	55	2471.58	Gd II	75	2477.43	Re II
6	2459.74	Kr IV	50	2465.91	Fe II	3000	2471.66	Ce III	15	2477.54	Rh II
10 w	2459.77	Pr III	15	2466.50	Fe II	150 h	2471.97	Mo I	70	2477.57	Mo II
40	2459.90	B II	230	2466.52	W II	160	2472.06	Ni I	150	2477.69	N IV
110	2459.99	Dy II	60	2466.67	Fe II	120	2472.13	Ta I	10	2477.78	Eu III
60	2460.08	In I	3	2466.68	I IV	50000	2472.20	Rb II	290	2477.80	W II
270	2460.16	W I	50	2466.68	Mo II	290	2472.28	Os I	200	2477.823	P IV
	2460.2	Li I	3	2466.69	I III	800	2472.336	Fe I	150	2478.070	P IV
28	2460.25	Yb II	35	2466.73	Nb I	40	2472.43	Fe II	210	2478.11	Ir I
50	2460.34	Nb III	60	2466.82	Fe II	30	2472.51	Rh I	150	2478.22	Ta I
60	2460.44	Fe II	1500	2466.84	Gd III	480	2472.51	W I	250	2478.256	P IV
50	2460.45	Nb III	3000 h	2466.85	Pa	50	2472.55	Pd II	65	2478.29	Nb II
450	2460.49	Hf II	1400	2466.85	W I	40	2472.60	Fe II	400	2478.32	Sb I
110	2460.5	S III	30	2466.87	Tc I	100	2472.88	Cr III	10 w	2478.32	Pr III
8	2460.55	Ra II	3	2466.96	I IV	1000	2472.895	Fe I	800	2478.56	C I
100	2460.55	Ta I	50	2466.97	Mo II	8	2472.95	Ar III	60	2478.57	Fe II
60	2460.61	Y II	3	2466.99	I III	130	2473.09	Rh I	50	2478.65	La III
10 w	2460.72	Pr III	130	2466.99	Ta II	150	2473.13	Ta I	100	2478.66	Ge II
90	2461.04	Rh II	870	2467.30	Ir I	200	2473.16	Fe I	120	2478.73	F III
390	2461.20	Re I	130	2467.37	Ta II	120	2473.31	Ta II	280	2478.93	Ru II
160	2461.27	N II	440	2467.44	Pt I	50	2473.32	Fe II	200	2479.02	Re I
80	2461.28	Fe II	200	2467.57	Re II	200	2473.40	Ne III	8000	2479.44	Ce III
10	2461.33	F V	60	2467.732	Fe I	10 w	2473.42	Pr III	120	2479.480	Fe I
200	2461.4	As IV	15	2467.75	Mg III	150	2473.72	Re II	3000	2479.51	Ce III
1800	2461.42	Os I	120	2467.85	Re II	200	2473.75	Zr IV	100	2479.77	Cr III
400	2461.74	Hf III	140	2467.97	Hf II	80	2473.84	Ag II	1200	2479.776	Fe I
10	2461.79	Eu III	30 h	2468.02	In I	100	2473.92	Hf II	65	2479.94	Nb II
40	2461.81	Mo II	10	2468.20	Pr III	50	2473.93	Th III	10	2479.98	Pr III
800 c	2461.84	Re II	100	2468.22	Gd II	30	2474.04	Ru I	20	2480.02	Eu III
100	2461.86	Fe II	15	2468.29	Fe II	30	2474.05	Fe II	770	2480.13	Tm II
10	2462.18	Pr III	500	2468.41	Cu III	5	2474.06	Kr IV	870	2480.13	W I
100	2462.181	Fe I	600	2468.60	Gd IV	1200	2474.15	W I	100	2480.16	Fe II
300	2462.39	Br III	80	2468.72	Nb III	600	2474.62	Ta I	40	2480.41	Cs II
2	2462.50	I III	50	2468.78	Mo II	20	2474.73	Na III	150	2480.44	Sb I
1500	2462.647	Fe I	18	2468.85	Na III	290	2474.78	Os I	8	2480.46	Sb II
10000	2462.76	Cm II	600	2468.879	Fe I	600	2474.814	Fe I	5	2480.56	Hg III
480	2462.79	W I	110	2468.90	Os II	10	2474.94	Eu III		2480.6	Be I
65	2462.89	Nb I	10	2468.97	Pr III	10	2475.06	Li I	50	2480.70	Tc I
10	2462.90	Pr III	6	2469.03	Tl II	20	2475.11	Tc I	110	2480.93	Dy II
55	2462.94	Ru I	55	2469.08	Nb I	3300	2475.12	Ir I	390	2480.96	W I
130	2462.97	Ce II	1100	2469.14	Gd III	50	2475.12	Fe II	10	2481.02	Pr III
50	2463.29	Fe II	210	2469.18	Hf II	160	2475.17	Re II	15	2481.05	Fe II
30	2463.30	Eu III	80	2469.27	Lu II	120	2475.33	Ta I	28	2481.11	Ru II
30	2463.61	Rh I	150	2469.29	Pd II	8	2475.35	I IV	150	2481.15	Tm II
100	2463.66	Th III	150 c	2469.36	Re II	6	2475.36	I III	2100	2481.18	Ir I
80 w	2463.69	Tc I	60	2469.39	Nb III	110	2475.41	Ru I	55	2481.44	Hf II
50	2463.72	Nb III	60	2469.51	Fe II	10	2475.50	Ra II	1500	2481.44	W I
50	2463.730	Fe I	100	2469.62	Ag III	40	2475.54	Fe II	21 h	2481.72	Lu II
160	2463.82	Ta II	50	2469.73	Cd II	15	2475.64	Rh II	70 h	2481.81	Mo I
70	2463.97	Hf II	10000	2469.95	Ce III	80	2475.87	Nb III	120	2481.86	Ta II
40	2464.01	Fe II	30	2470.04	Mo II	130	2476.07	Cs II	40	2481.999	Hg I
15	2464.06	Hg I	80	2470.06	Pd II	7	2476.10	Ar III	40	2482.00	Hg I
15	2464.064	Hg I	130	2470.29	F III	10	2476.24	Eu III	25	2482.04	Rh I
430	2464.19	Hf II	75	2470.39	Rh I	15	2476.26	Fe II	100	2482.10	Ta I
200	2464.20	Co II	25	2470.41	Fe II	130 r	2476.378	Pb I	480 d	2482.10	W I
270	2464.30	W I	40	2470.51	Eu III	20	2476.40	Sn I	80	2482.12	Fe II
9	2464.45	Sc IV	120	2470.61	Re II	1700	2476.42	Pd I		2482.21	W I
30	2464.47	Eu III	20	2470.65	Rh III	20	2476.45	Eu III	25	2482.32	Fe II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
1000	2482.36	Cu III	100	2487.066	Fe I	60	2492.48	Kr II	2600	2498.41	Os I
360	2482.43	Os I	55	2487.16	Hf I	25	2492.72	Tc I	140	2498.42	Ru II
65	2482.57	Mo II	1000	2487.17	Pt I	200	2492.84	Re I	240	2498.50	Pt I
100	2482.58	Ta II	75	2487.29	Zr II	3000 h	2492.85	Pa	340	2498.53	Cl II
300	2482.60	Br III	980	2487.33	Re I	75	2492.93	W II	140	2498.57	Ru II
55	2482.65	Hf I	120	2487.370	Fe I	60	2493.02	Nb III	80	2498.59	In II
100	2482.66	Fe II	70	2487.46	Gd II	620	2493.08	Ir I	200	2498.81	Pd II
30	2482.713	Hg I	150	2487.47	Rh I	1000	2493.15	Na II	200	2498.82	Co II
30	2482.72	Hg I	390	2487.50	W I	100	2493.18	Fe II	150	2498.90	Fe I
30	2482.79	Sr IV	130	2487.52	Tm II	4	2493.20	I IV	50	2499.00	Mn II
2	2482.82	Si IV	40	2487.93	Cd II	2	2493.21	I III	15	2499.02	Rh I
15	2482.87	Fe II	4000	2488.143	Fe I	500	2493.26	Fe II	45	2499.04	Gd II
100	2483.06	Cr III	30	2488.25	Ge IV	55	2493.29	Gd II	160	2499.1	S III
6	2483.20	Si III	60	2488.26	Cr III	20	2493.43	Tc I	10	2499.17	Eu III
50	2483.22	Tc I	300	2488.50	Br II	200	2493.44	O IV	350	2499.25	Br III
10000	2483.271	Fe I	4500	2488.55	Os I	65	2493.69	Ru II	21	2499.39	Eu II
20	2483.29	Eu III	110 d	2488.62	In II	200	2493.77	O IV	1300	2499.53	Gd III
10	2483.30	Pr III	600	2488.70	Ta II	20	2493.88	Fe II	100	2499.54	Tm II
50	2483.33	Rh I	110	2488.72	Gd II	60	2494.000	Fe I	100	2499.60	In II
300	2483.39	Sn I	10 w	2488.72	Pr III	40	2494.01	Kr III	140	2499.69	W II
13	2483.48	Sn II	60	2488.74	Nb III	85	2494.02	Ru I	100	2499.73	Nb III
300	2483.533	Fe I	25	2488.74	Pt II	10 w	2494.20	Pr III	85	2499.78	Ru I
25	2483.57	Sr IV	270	2488.77	W II	50	2494.251	Fe I	25	2499.81	Cd III
15	2483.72	Fe II	12	2488.86	Ar III	2	2494.27	I III	330	2499.92	Os I
10000	2483.82	Ce III	10	2488.91	Eu III	45	2494.48	Ru II	10	2499.97	Pr III
40	2483.82	Hg I	300	2488.92	Pd II	75 h	2494.51	Rh	40	2500.11	W II
40	2483.821	Hg I	100	2488.945	Fe I	35	2494.54	Be I	7	2500.19	Ga I
35	2483.88	Nb II	90	2488.95	In II	35	2494.58	Be I	40	2500.44	Mo II
1200	2483.92	Re I	390	2489.23	W II	100	2494.73	Be I	500	2500.54	Ge II
700	2483.94	Po I	5	2489.24	I IV	100	2494.74	I II	18	2500.57	Sr IV
10	2483.99	Pr III	4	2489.27	I III	2000	2495.16	Hf III	40	2500.58	Rh
100	2484.04	Ta II	30000	2489.44	Tm III	3	2495.16	I III	3	2500.71	Ga I
1000	2484.185	Fe I	80	2489.48	Fe II	300 h	2495.22	Br II	40	2500.92	Fe II
100	2484.19	P II	110	2489.6	S III	630	2495.26	W I	90 d	2500.99	In II
60	2484.24	Fe II	75	2489.61	Pd II	10 w	2495.37	Pr III	10	2501.0	Bi II
150	2484.37	F III	1000	2489.750	Fe I	10 w	2495.51	Pr III	100	2501.08	Th III
29	2484.40	W II	50	2489.83	Fe II	40	2495.58	Cd II	1000	2501.132	Fe I
30	2484.44	Fe II	30	2489.91	Ru I	85	2495.69	Ru II	40	2501.31	Fe II
7	2484.50	Hg III	50	2489.913	Fe I	200	2495.70	Sn I	2	2501.38	I IV
300	2484.56	Rb II	200	2490.12	Pt I	160	2495.82	Pt I	3	2501.41	I III
10 w	2484.60	Pr III	75	2490.16	Re II	100	2495.87	Fe I	140	2501.61	V I
700	2484.70	Rb II	200	2490.42	Yb III	370	2496.04	Re I	50	2501.693	Fe I
580	2484.74	W I	25	2490.42	Y I	2	2496.07	I III	370	2501.72	Re I
40	2484.75	Mo II	500	2490.46	Ta I	160	2496.2	S III		2501.90	W II
14	2484.89	Yb II	10	2490.50	Eu III	24	2496.24	Mo II	1000	2501.99	Zn II
500	2484.95	Ta I	700	2490.53	Po I	200	2496.25	Tm III	70	2502.02	Yb II
10 w	2485.16	Pr III	10	2490.54	Mg III	210	2496.27	Ir I	30 h	2502.12	Ac IV
40 h	2485.31	Mo I	170	2490.61	Dy II	170	2496.31	Cr I	40 w	2502.12	Pm II
100	2485.38	Ir I	3000	2490.644	Fe I	35	2496.35	Gd II	200 h	2502.18	Po
1	2485.38	Si IV	100	2490.71	Fe II	2000	2496.38	Rb II	330	2502.29	Os I
4	2485.51	I IV	100	2490.77	Rh II	45	2496.48	Zr II	570	2502.35	Re II
35	2485.67	Gd II	60	2490.86	Fe II	600	2496.533	Fe I	60	2502.39	Fe II
100	2485.792	Cu II	3	2491.00	Cd I	65	2496.56	Ru I	130	2502.46	Rh I
390	2485.81	Re I	290	2491.02	Os I	230	2496.64	W II	110	2502.53	Cr I
50	2485.990	Fe I	10	2491.08	Eu III	1000	2496.77	B I	250	2502.63	Ir I
50	2486.02	Nb III	700	2491.14	Br IV	100	2496.77	Tc II	200	2502.67	Rb II
70	2486.15	In II	2000	2491.155	Fe I	110	2496.83	N II	470	2502.74	Cl II
530	2486.24	Os II	100	2491.40	Fe II	10	2496.92	Eu III	18000 c	2502.81	La IV
800	2486.373	Fe I	250	2491.60	Tm II	70	2496.97	N II	65	2502.84	Mo II
200	2486.44	Co II	290	2491.69	Os I	290	2496.99	Hf II	300	2502.84	Na II
700	2486.46	Cu III	20	2491.69	Yb III	25	2497.03	Na III	170	2502.91	Ho II
20	2486.50	Tc I	18	2491.78	Ru I	95	2497.48	W II	4100	2502.98	Ir I
250	2486.52	Pd II	10	2491.97	Pr III	10000	2497.50	Ce III	40	2503.33	Fe II
100	2486.52	Sr III	2	2492.04	Er III	1000	2497.73	B I	3000	2503.56	Ce III
100	2486.691	Fe I	2000 r	2492.15	Cu I	14	2497.74	Ca III	20	2503.57	Fe II
120	2486.70	Ta I	30	2492.30	Rh I	50	2497.82	Fe II	50	2503.59	Sr III
500	2486.91	Cl III	25	2492.34	Fe II	90	2497.962	Ge I	15	2503.84	Rh II
10	2486.92	Eu III	360	2492.42	Os I	200	2498.22	Re I	60	2503.87	Fe II
10	2486.99	Sn II	10	2492.48	Eu III	85	2498.28	Mo II	300	2504.29	Rh II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
190	2504.31	Cr I	350	2509.70	Rh I	25	2516.05	Ti III	4	2521.72	I III
170	2504.37	Ir I	170	2509.71	Ir I	500	2516.113	Si I	30	2521.82	Fe II
500	2504.39	Os I	70	2509.71	Os II	500	2516.14	V III	270	2522.04	W II
2000	2504.43	Ce III	30	2510.17	Tc I	30	2516.22	Cd II	15	2522.07	Yb III
600	2504.45	Ta I	250	2510.17	W I	18	2516.35	Yb II	200	2522.14	Eu III
260	2504.51	Os I	17	2510.26	Na III	80	2516.570	Fe I	250	2522.17	Tm II
570	2504.52	Co I	90	2510.31	Dy II	20	2516.60	Mn II	220	2522.23	N II
24	2504.54	Ti I	75	2510.47	W II	30	2516.74	Mn II	500	2522.38	Cu III
230	2504.60	Re II	100	2510.54	Sb I	10	2516.789	Ar II	50	2522.44	Yb II
110	2504.65	Nb I	50	2510.66	Rh II	2	2516.82	I III	50	2522.480	Fe I
680	2504.70	W I	1000	2510.835	Fe I	300	2516.82	Yb III	5	2522.61	Sn II
2000	2504.71	Tm III	500	2510.87	Ni II	890	2516.88	Hf II	4000	2522.849	Fe I
25	2505.07	Ba III	110	2511.00	Nb II	110	2516.92	Cr I	10	2522.98	In I
40	2505.10	Rh II	300	2511.03	Rh II	4	2517.0	Kr IV	780	2523.41	W I
28	2505.48	Yb II	200	2511.16	Co II	50	2517.13	Fe II	15	2523.66	Cs II
150	2505.67	Rh I	9	2511.20	He II	180	2517.14	V I	200	2523.66	Fe I
150	2505.73	Pd II	180	2511.65	V I	200	2517.2	O IV	40	2523.83	Ba III
120	2505.74	Ir I	120	2511.76	Fe II	110	2517.32	Ru II	90	2523.92	Sn I
50	2505.93	Pt I	50	2511.80	Mo II	75	2517.43	Ti II	425	2524.108	Si I
270	2505.94	Re I	170	2511.94	Ir I	7	2517.51	Si IV	180	2524.11	Tm II
270	2506.02	W I	50	2511.95	Nb III	170	2517.61	Dy II	1000	2524.24	Rb II
80	2506.09	Fe II	180	2511.95	V I	300	2517.661	Fe I	500	2524.293	Fe I
200	2506.19	Mo III	350	2512.06	C II	860	2517.87	Co I	140	2524.30	Pt I
40	2506.25	Yb III	140	2512.06	Yb II	500	2517.92	Os I	200 l	2524.41	C IV
150	2506.273	Cu II	80	2512.275	Fe I	20	2517.94	Eu III	70	2524.49	Bi I
450	2506.30	Na II	40	2512.28	Ba III		2518.	Li I	5	2524.5	Kr IV
80	2506.41	Cr III	110 d	2512.31	In II	5	2518.02	Kr IV	75	2524.64	Ti II
500	2506.46	Co II	400	2512.365	Fe I	800	2518.102	Fe I	200 h	2524.65	Co II
60	2506.63	Ag II	170	2512.58	Ir II	60	2518.14	W II	70	2524.7	B IV
40	2506.80	Fe II	240	2512.65	Ta I	6	2518.40	Ar IV	40	2524.88	Ir II
360	2506.88	Co I	580	2512.69	Hf II	12 p	2518.40	Mg IV	300	2524.97	Co II
425	2506.90	Si I	60	2512.69	Th III	660	2518.44	Os I	100	2525.02	Fe I
150	2506.90	V I	110	2512.81	Ru I	110	2518.51	Ce II	170	2525.05	Ir I
	2506.94	Li II	660	2512.87	Os I	15 h	2518.59	Cd I	25 h	2525.196	Cd I
260	2507.01	Ru II	580	2513.03	Hf II	80	2518.71	Cr I	200	2525.39	Fe II
130	2507.15	Tm II	2400	2513.25	Os I	95	2518.73	Ho II	360	2525.60	Ti II
35	2507.18	Os II	12	2513.28	Ar IV	40	2519.04	Ti I	9	2525.69	Ar IV
16	2507.43	Be II	60	2513.30	Al I	60	2519.05	Fe II	13	2525.99	Rh I
600	2507.45	Ta I	110	2513.32	Ru II	350	2519.202	Si I	25	2526.07	Fe II
30	2507.60	Mn II	75	2513.36	Rh II	200	2519.29	Os I	410	2526.22	V I
120	2507.63	Ir I	2	2513.43	La III	6	2519.38	Kr IV	300	2526.29	Fe II
5	2507.71	Sb III	170	2513.55	Dy II	390	2519.52	Cr I	1200 d	2526.35	Ta I
200	2507.73	O IV	5	2513.55	Ga II	240	2519.62	V I	120	2526.593	Cu II
240	2507.78	V I	110	2513.55	Ho II	150	2519.629	Fe I	8 c	2526.69	Pb II
500	2507.900	Fe I	40	2513.62	Cr I	8	2519.74	I IV	130	2527.02	Tm I
24	2508.00	W II	210	2513.71	Ir I	6	2519.75	I III	20	2527.10	Fe II
20	2508.02	Sr IV	3	2513.74	I IV	3000	2519.78	Tm III	190	2527.12	Cr I
11	2508.07	Yb II	2000	2513.76	Eu III	330	2519.79	Os I	70	2527.14	Mo II
50	2508.11	Cr I	50	2514.07	Pt I	500	2519.82	Co II	100	2527.41	In III
60	2508.16	In II	3	2514.15	Ga II	570	2520.01	Re I	110	2527.42	Tm II
220	2508.2	S III	250	2514.18	Rb II	110	2520.22	N II	2000	2527.435	Fe I
1	2508.2	Tl I	50	2514.31	Th III	1600	2520.38	Gd III	30	2527.70	Fe II
130	2508.27	Ru I	375	2514.32	Si I	310	2520.46	W I	430	2527.76	W I
30	2508.34	Fe II	50	2514.38	Fe II	130	2520.53	Rh II	24	2527.84	Ti III
500	2508.49	Cu III	50	2514.47	Pd II	140	2520.54	Ti I	210	2527.90	V II
120	2508.50	Pt I	15000	2515.02	La IV	160	2520.79	N II	50	2527.96	Zn II
80	2508.53	Ho II	60	2515.03	Pt I	200	2520.87	Tm II	29	2527.98	Ti I
60	2508.53	Nb III	660	2515.04	Os I	8	2520.93	Sc IV	120	2528.47	V II
100	2508.59	Er III	65	2515.08	Mo II	40	2521.09	Fe II	450	2528.509	Si I
50	2508.753	Fe I	1000	2515.16	Hf III	250	2521.16	V III	60	2528.51	Ba II
	2508.78	Li II	120	2515.36	Ir I	780	2521.32	W I	2000 r	2528.52	Sb I
10	2508.91	Cd I	600	2515.46	Na II	4300	2521.36	Co I	15	2528.54	Sb II
60	2508.98	Cr I	130	2515.48	Hf II	100	2521.37	In I	500	2528.62	Co II
1800 c	2508.99	Re I	240	2515.58	Pt I	110	2521.40	Nb II	150	2528.84	V II
110	2509.07	Ru I	25	2515.69	Bi I	540	2521.50	Re I	20	2528.88	Fe II
1300	2509.08	Tm II	130	2515.72	Cs II	250	2521.55	V III	2900	2528.97	Co I
50	2509.11	Cd II	200	2515.75	Rh I	20	2521.66	Mn II	20	2529.08	Fe II
250	2509.12	C II	150	2515.81	Zn I	450	2521.70	Br II	800	2529.135	Fe I
230	2509.19	O IV	400	2515.87	Al IV	6	2521.72	I IV	20	2529.14	Yb III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
10	2529.19	Mg III	70	2534.34	Cr II	110 h	2540.45	Mo I	10	2546.09	Si III
25	2529.23	Fe II	100	2534.42	Fe II	570	2540.51	Re I	40	2546.44	Fe II
80	2529.31	Fe I	1100	2534.46	Ir I	20	2540.52	Fe II	400	2546.55	Sn I
80	2529.34	Tc II	80	2534.57	Pd II	200	2540.66	Fe II	80	2546.67	Fe II
40	2529.41	Pt I	190	2534.62	Ti II	80	2540.91	Er III	120	2546.67	Ru I
350	2529.49	Br III	10	2534.709	Ar II	600	2540.972	Fe I	200	2546.74	Co II
250	2529.55	Fe II	90	2534.769	Hg I	80	2541.10	Fe II	240	2546.80	Ta I
150	2529.836	Fe I	90	2534.77	Hg I	50	2541.11	Mn II	80	2546.87	Fe I
210	2529.85	Ti I	4	2534.79	Mg IV	400	2541.48	Br II	40	2546.87	Lu II
300 s	2529.98	C IV	370	2534.80	Re I	100	2541.48	Ir I	10	2546.88	Ti IV
200 p	2530.09	Co II	50	2534.82	W II	15	2541.50	Ca III	260	2546.96	Cl II
40	2530.11	Fe II	300	2534.95	Po I	8	2541.79	Ti IV	6	2547.0	Kr IV
720	2530.13	Co I	120	2535.49	Fe II	25	2541.82	Si III	1200	2547.14	W I
240	2530.18	V I	150	2535.59	Ru II	60	2541.84	Fe II	120	2547.20	Ir I
15	2530.25	Na III	400	2535.607	Fe I	190	2541.92	Ti I	110	2547.28	Er II
160	2530.3	B IV	700	2535.61	P I	300	2541.94	Co II	14	2547.57	Y
50	2530.34	Mo II	100	2535.66	Mn II	580	2542.02	Ir I	120	2547.69	Ir I
40	2530.45	Cr I	900 d	2535.76	La IV	300	2542.10	Fe I	150	2547.901	Th II
200	2530.687	Fe I	130	2535.87	Ti II	220	2542.10	Zr II	50	2547.92	Tc II
20	2530.72	Mn II	2900	2535.96	Co I	20	2542.44	Ge IV	300	2548.0	Se I
120	2530.72	Te I	30	2535.98	Mn II	1000	2542.51	Os I	18	2548.02	Sr IV
20	2530.86	Tl II	1300	2536.10	Gd III	120	2542.66	Tm II	110	2548.20	Hf II
25	2530.92	Ba III	860	2536.49	Co I	330	2542.67	Mo II	250	2548.21	V III
80	2530.99	Cr III	50	2536.49	Pt I	120	2542.77	F III	330	2548.22	Mo I
2	2531.03	Er III	15000	2536.506	Hg I	25	2542.78	Fe II	10	2548.30	Eu III
80 h	2531.17	Sn I	15000	2536.52	Hg I	40	2542.80	Ir II	340	2548.34	Co I
340	2531.19	Hf II	60	2536.67	Fe II	14	2542.80	Na III	20	2548.59	Eu III
190	2531.25	Ti II	110	2536.71	Rh	80	2542.92	Mn II	20	2548.59	Fe II
600	2531.54	Na II	8	2536.76	Er III	500	2543.23	Tc II	13	2548.60	Rh
13	2531.74	Rh I	200	2536.792	Fe I	65	2543.25	Ru II	200	2548.68	Ce II
20	2531.80	Mn II	200	2536.80	Fe II	3	2543.31	Er III	100	2548.74	Fe II
20	2531.87	Fe II	50	2536.84	Fe II	60	2543.38	Fe II	100	2548.75	Mn II
4	2531.98	I IV	130	2536.86	Ho II	50	2543.45	Mn II	30	2548.83	Os II
20000	2531.99	Ce III	370	2536.95	Lu II	40	2543.61	Mo II	80	2549.08	Fe II
3	2531.99	I III	100	2537.02	Er II	28	2543.68	Gd II	50	2549.09	W II
600	2532.12	Ta II	110	2537.04	Rh II	130	2543.81	Dy II	110	2549.28	V II
860	2532.18	Co I	50	2537.14	Fe II	250	2543.92	Fe I	80	2549.39	Fe II
70	2532.31	Mo II	580	2537.22	Ir I	7900	2543.97	Ir I	20	2549.44	Lu I
100	2532.36	Er III	200	2537.33	Hf II	16	2544.19	Au I	60	2549.46	Fe II
110	2532.381	Si I	5	2537.54	I IV	40	2544.22	Rh	18	2549.46	Pt I
200	2532.44	Os I	2	2537.56	I III	280	2544.22	Ru I	280	2549.48	Ru I
180	2532.46	Zr II	65	2537.65	Yb II	1700	2544.25	Co I	160	2549.54	Cr I
500	2532.48	Cl III	170	2537.68	Ir I	80	2544.37	Cr III	550	2549.58	Ru I
120	2532.52	Ir I	80	2537.73	Cr III	20 h	2544.5	Bi II	600	2549.613	Fe I
50	2532.66	Rh	100	2537.92	Mn II	50	2544.613	Cd I	20	2549.72	Lu I
50000	2532.75	La IV	780	2538.00	Os II	150	2544.70	Fe I	40	2549.77	Fe II
50	2532.78	Mn II	240	2538.10	Os I	740 d	2544.74	Re I	500	2549.88	Cl II
5	2532.894	Th I	50	2538.20	Fe II	390	2544.80	Nb II	6	2550.02	K II
75	2533.06	Mn I	440	2538.46	Mo II	300	2544.805	Cu II	6	2550.02	K III
990	2533.13	Ir I	40	2538.50	Fe II	60	2544.81	Tc II	60	2550.03	Fe II
70	2533.230	Ge I	500	2538.66	Cu III	40	2544.97	Fe II	14	2550.06	Yb II
50	2533.33	Mn II	270	2538.67	Yb II	90	2545.12	Dy II	160	2550.09	Re II
60	2533.52	Au II	20	2538.68	Fe II	50	2545.17	Cr III	40	2550.10	W II
13	2533.59	Rh	100	2538.80	Fe II	40	2545.22	Fe II	25	2550.15	Fe II
100	2533.60	I II	100	2538.91	Fe II	560	2545.22	Sc II	10	2550.17	Y
120	2533.63	Fe II	150	2538.99	Fe II	580	2545.34	W I	780	2550.38	W I
780	2533.64	W I	130	2539.08	Cs II	20	2545.44	Fe II	40	2550.39	Yb III
170	2533.80	Ho I	10	2539.14	Eu III	370	2545.48	Re I	45	2550.51	Zr I
60	2533.80	Fe I	25	2539.17	Cs II	240	2545.49	Ta II	60	2550.65	Cs II
200 d	2533.82	Co II	160	2539.20	Pt I	150	2545.54	Ir I	50	2550.68	Fe II
500	2533.99	P I	3000	2539.27	Ce III	50	2545.64	Cr I	220	2550.74	Zr II
20	2534.03	Sr IV	50	2539.357	Fe I	100	2545.64	Nb III	110 h	2550.85	Mo I
50	2534.07	Rh	50	2539.44	Mo II	8	2545.67	I IV	460 d	2551.07	Ta I
30	2534.10	Mn II	50 h	2539.44	Pd II	350	2545.70	Rh I	350 h	2551.09	Br III
150	2534.10	Re II		2539.49	Li II	7	2545.71	I III	130	2551.17	Cs II
1600	2534.11	Gd III	90	2539.65	Zr I	10	2545.95	Er III	2	2551.26	Ga II
80	2534.22	Mn II	30	2539.72	Rh	800	2545.978	Fe I	2700	2551.35	W I
200	2534.27	I II	23	2540.06	Ti III	5	2546.0	Kr IV	110	2551.38	Nb II
100	2534.33	Hf III	12	2540.28	Y	790	2546.03	Ir I	320	2551.40	Hf II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
210	2551.40	Ir I	180	2557.94	Dy II	25	2563.86	Hg I	100	2569.56	Pd II
1600	2551.56	Gd III	80	2557.94	Nb III	150	2563.86	Tm II	340	2569.71	U II
24	2551.7	Li II	1000	2557.95	Zn II	25	2563.861	Hg I	100 h	2569.87	Zn I
150	2551.84	Pd II	1500 w	2558.01	Po I	110	2563.91	W II	210	2569.88	Ir I
50	2551.85	Mn II	40 h	2558.01	Sn I	500	2564.04	Co II	25	2570.48	Ba III
50	2551.98	Cd II	200	2558.06	O III	160	2564.17	Eu II	25	2570.52	Fe II
300	2552.02	Re I	10	2558.07	Eu III	910	2564.18	Ir I	100	2570.62	Ir I
70	2552.15	Yb II	100 h	2558.08	Ac IV	340	2564.19	Re I	80 h	2570.72	V IV
50	2552.25	Pt I	4	2558.08	Kr IV	85	2564.34	Mo II	80	2570.74	Er III
150	2552.29	Dy II	25	2558.58	Pr II	2100	2564.46	Gd III	350 h	2570.83	Br III
2900	2552.37	Sc II	95	2558.59	Mn II	80	2564.76	Cr III	30	2570.85	Fe II
10000	2552.46	Tm III	50	2558.61	Tc II	110	2564.82	V I	1	2570.91	Mg I
120	2552.65	V I	25	2558.62	Rh I	460	2564.84	Cl II	100	2570.97	Ru I
45	2552.67	Au II	80	2558.88	Mo II	1	2564.94	Mg I	110	2571.03	Ti II
55	2552.70	Yb II		2559	Li II	1000	2565.04	Gd III	40	2571.04	Sr IV
360	2552.76	Tm I	250	2559.08	Re I	70	2565.13	In II	930	2571.23	Lu II
3	2552.87	Ga II	26	2559.18	Eu II	30	2565.22	Mn II	110	2571.33	Nb II
40	2553.06	Cr I	130	2559.19	Hf II	130	2565.41	Nb I	28	2571.36	Yb II
600	2553.25	P I	14	2559.21	Si III	440	2565.41	U II	2100	2571.39	Zr II
30	2553.27	Mn II	300	2559.41	Co II	23	2565.42	Ti III	530	2571.44	W II
310	2553.37	Co I	30	2559.41	Mn II	150	2565.51	Pd II	20	2571.45	Mo II
25	2553.465	Cd I	1200	2559.43	Ta I	21	2565.57	Yb II	340	2571.51	Ta II
70	2553.56	In II	50	2559.54	Ba III	500	2565.593	Th II	25	2571.58	Sr IV
150 c	2553.59	Re II	200	2560.03	Co II	3	2565.789	Cd I	500 r	2571.58	Sn I
450	2553.82	W I	290	2560.12	W I	50	2565.79	Rh I	890	2571.67	Hf II
2200	2553.90	Gd III	1100	2560.15	In I	500	2565.92	Ni II	150	2571.74	Cr I
2100	2554.04	Gd III	90	2560.21	Dy II	2400	2565.95	Gd III	100	2571.756	Cu II
150	2554.22	V III	2300	2560.25	Sc II	45	2566.04	Rh I	340	2571.78	Os I
190	2554.40	Ir I	130	2560.26	Ru I	20	2566.22	Fe II	370	2571.81	Re II
160 d	2554.44	In II	40	2560.28	Fe II	1000	2566.24	I II	170 d	2572.24	W II
310	2554.46	Os I	10	2560.36	Eu III	90	2566.25	Dy II	1	2572.25	Mg I
10	2554.50	Eu III	100	2560.56	Yb III	40	2566.26	Mo II	5	2572.32	Zr IV
460	2554.62	Ta II	130	2560.69	Cr I	400	2566.37	Cu III	320	2572.34	Mo I
370	2554.63	Re II	400 h	2560.74	Hf III	600	2566.49	Os I		2572.35	W II
26	2554.78	Eu II	120	2560.83	Ru I	270	2566.588	Th II	50	2572.65	Ti II
410	2554.86	W II	1	2560.94	Mg I	100	2566.78	Yb III	230	2572.70	Ir I
500	2554.90	P I	540	2561.65	Tm II	290	2566.88	Os I	580	2572.76	Mn I
240	2555.05	Ta I	10	2561.66	Yb III	60	2566.91	Fe II	500	2572.93	Cd II
310	2555.07	Co I	35	2561.80	Lu II	25	2566.92	Rh II	1000	2573.03	Cs II
580	2555.09	W II	300	2561.86	Rb III	50	2567.01	Tc II	13	2573.15	Yb II
	2555.21	W I	730	2561.97	W I	250	2567.05	Mo I	300 h	2573.17	Br III
4	2555.28	Ga II	65	2562.08	Mo II	90 w	2567.12	Ne II	400	2573.33	Cu III
300	2555.29	Yb III	15	2562.087	Ar II	50	2567.28	Rh	430	2573.54	Ta I
210	2555.35	Ir I	25	2562.09	Fe II	1100	2567.35	Co I	1800	2573.57	Gd III
550	2555.36	Rh I	460	2562.10	Ta I	50	2567.44	Nb III	400	2573.66	Zr IV
65	2555.42	Mo II	80 p	2562.12	Ne II	60	2567.45	Zr I	100	2573.71	Rb III
40	2555.60	Sr IV	210	2562.13	V I	300 h	2567.46	Hf III	390	2573.79	Ta I
560	2555.82	Sc II	960	2562.15	Co I	22	2567.56	Ti III	320	2573.90	Hf II
170	2555.88	Ir I	12	2562.17	Ar IV	2000	2567.61	Yb III	75	2573.95	W II
65	2555.99	Ti II	1	2562.26	Mg I	570	2567.64	Zr II	230	2574.02	V I
100	2556.11	F II	15	2562.31	Li I	80	2567.73	Ho II	150	2574.06	Sb I
3	2556.298	Ge I	400	2562.31	Po	10	2567.75	Sb II	960	2574.35	Co I
45	2556.43	Zr I	130	2562.41	Nb II	50	2567.80	Zn II	150	2574.36	Fe II
1000	2556.51	Re I	400	2562.53	Fe II	20	2567.82	Te II	50	2574.42	Mo II
75	2556.57	Mn II	100	2562.87	Ag III	240	2567.98	Al I	1000	2574.52	Tm III
40	2556.75	Mo II	110	2563.15	Ru I	50	2567.98	Zn II	130	2574.54	Cs II
310	2556.75	W I	190	2563.16	Os II	10	2568.07	Ar IV	25	2574.66	Rh
80	2556.84	Ho I	230	2563.16	W II	130	2568.17	Cs II	26	2574.76	Eu II
30	2556.89	Mn II	1100	2563.21	Sc II	110	2568.17	Eu II	250 h	2574.83	C II
400	2556.92	Br II	30	2563.25	Kr III	540	2568.64	Re II	2	2574.94	Mg I
50 h	2556.92	V IV	150	2563.28	Ir I	85	2568.641	Si I	10	2574.96	Te II
130	2556.94	Nb II	150	2563.32	V III	250	2568.69	Cs II	500	2574.98	Tm III
80	2557.15	Cr I	2500	2563.33	Gd III	160	2568.77	Ru I	30	2575.06	Tc II
50	2557.22	Er III	24	2563.44	Ti III	480	2568.83	Os I	480	2575.10	Al I
1	2557.23	Mg I	200	2563.48	Fe II	1600	2568.87	Zr II	60	2575.40	Al I
300	2557.33	Po I	300	2563.51	Lu III	100	2569.03	Nb I	480	2575.51	Mn I
3000	2557.49	Ce III	250	2563.61	Hf II	1800	2569.27	Gd III	50 h	2575.63	Ag I
50	2557.54	Mn II	150	2563.65	Mn II	120	2569.47	Sr I	50	2575.74	Fe I
500	2557.90	Tm III	30	2563.679	Si I	7	2569.53	Ar IV	25	2575.75	Rh I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
2000	2576.06	Gd III	740	2581.96	Os I	800	2590.04	Ne III	8	2595.62	Fe III
12000	2576.10	Mn II	45000	2582.05	La IV	130	2590.09	Cs II	400	2595.68	Ne III
5	2576.10	Te II	80 h	2582.13	Lu II	15	2590.13	Sb III	250	2595.76	Mn I
1300	2576.15	Gd III	250	2582.16	Mo I	20 w	2590.19	Tc I	1300	2595.81	Gd III
13	2576.23	Rh	300 d	2582.22	Co II	35	2590.26	Ti I	2	2595.97	Mg I
80	2576.28	Tc II	8 p	2582.37	Fe III	29	2590.31	Tb II	400 h	2595.98	Br III
25	2576.29	Hg I	100	2582.44	Zn I	12	2590.41	Ca III	170	2596.00	Os II
25	2576.290	Hg I	300	2582.49	Zn I	150	2590.529	Cu II	50	2596.00	Pt I
15	2576.47	Ti III	320	2582.54	Hf II	80	2590.72	Er III	18	2596.16	Yb II
40	2576.56	Mo II	100	2582.58	Fe II	1000	2590.76	Os I	28	2596.32	Yb II
8 c	2576.60	Pb II	2000	2582.79	I II	390	2590.94	Nb II	10	2596.34	Eu III
200	2576.688	Th II	400	2583.32	Zr IV	110	2590.94	N II	310 l	2596.45	Ta II
300	2576.691	Fe I	75	2583.40	Zr II	60	2591.05	Ho II	170 h	2596.49	Tm I
130	2576.74	Cs II	1700	2583.62	Gd III	170	2591.12	Ru I	65	2596.58	Ti I
320	2576.82	Hf II	130	2583.81	F III	10	2591.12	Te II	8 h	2596.64	Ba I
25	2576.86	Fe II	390	2583.99	Nb II	340	2591.25	U II	230	2597.047	Th II
100	2577.07	Rb III	340	2584.03	Ta II	18000 c	2591.30	La IV	90	2597.13	Mo III
230	2577.14	Eu II	1	2584.22	Mg I	130	2591.33	Hf II	20	2597.19	Tc II
45	2577.151	Si I	550	2584.31	Mn I	29	2591.42	Tb II	500	2597.23	Yb III
740	2577.26	Ir I	390	2584.39	W I	170	2591.49	W II	40	2597.38	Mo II
80 r	2577.260	Pb I	1500	2584.54	Fe I	90	2591.56	Dy II	95000 w	2597.50	La IV
600	2577.37	Ta II	110	2584.61	Tb II	20	2591.56	Er III	55	2597.71	Tb II
50	2577.6	He I	2000	2584.71	Ce III	40	2591.77	Mo II	40 h	2598.04	Pr II
100	2577.65	Cr I	3	2584.87	Cd I	200	2591.83	Er III	1500 r	2598.05	Sb I
4000	2577.67	Ce III	400 h	2584.99	Br III	380	2591.85	Cr I	30	2598.07	Rh
29	2577.73	Tb II	220	2585.30	Dy I	1	2591.89	Mg I	500 r	2598.09	Sb I
340	2577.78	Ta I	100	2585.48	Tm III	200	2591.98	Os I	20	2598.39	Er III
40	2577.86	Tc II	2	2585.56	Mg I	120	2592.02	Ru I	110	2598.74	W II
1	2577.89	Mg I	30	2585.95	Mo II	30	2592.026	Cd I	70 d	2598.75	In II
20	2577.90	V V	28	2586.13	Gd II	740	2592.06	Ir I	80	2598.86	Nb III
60	2577.92	Fe II	550	2586.31	Na II	270	2592.20	Nb I	95	2598.90	Mn II
1400	2578.13	Gd III	80	2586.52	Ho I	500	2592.534	Ge I	740	2599.04	Ir I
300	2578.14	Hf II	8	2586.61	Ra II	75	2592.54	Dy II	30	2599.10	Sr III
25	2578.27	Pr I	290	2586.73	Er II	130	2592.57	Er II	800	2599.14	Yb III
2000	2578.30	Ce III	380	2586.79	Re I	24	2592.64	Tb II	3000	2599.16	Pa II
150	2578.32	Os II	200	2586.83	Rb III	20	2592.69	Yb III	3	2599.18	Er III
40	2578.36	Mo II	3	2586.9	Kr IV	100	2592.82	Tc I	140	2599.28	F III
100	2578.57	Ru I	11	2586.93	Sc IV	10	2592.85	Te II	12	2599.47	Ar IV
100	2578.71	Ir I	110	2587.04	Er II	250	2592.94	Mn I	290	2599.86	Re I
200	2578.74	Nb I	13	2587.15	Ca III	95	2592.99	Ho I	270	2599.92	Ti I
1600	2578.76	Gd III	500	2587.22	Co II	250	2593.05	V III	220	2600.14	Ta I
1700	2578.79	Lu II	40	2587.29	Rh II	430	2593.08	Ta I	130	2600.16	Dy II
300hl	2578.79	Tc I	500	2587.52	Co II	120	2593.23	F III	200	2600.270	Cu II
300	2578.80	Po	400	2587.64	Po I	1	2593.23	Mg I	130	2600.76	Dy II
5	2578.91	Hg I	20 w	2587.71	Pr III	60	2593.24	Pd II	230	2600.882	Th II
7	2579.24	Te II	50	2588.20	Cr I	300	2593.46	I II	110	2601.09	Tm I
190	2579.26	W II	2000	2588.21	Gd III	60	2593.51	Fe I	200	2601.76	In I
30	2579.31	Pr I	430	2588.27	Tm II	600	2593.60	Ne III	370	2601.96	W I
35	2579.49	Ir II	3	2588.28	Mg I	190	2593.64	Ti I	340	2602.00	As II
100	2579.53	Ru I	2000	2588.46	Gd III	100	2593.64	Zr III	150	2602.04	Ir I
1000	2579.57	Yb III	100	2588.62	Yb III	410	2593.66	Ta II	25 h	2602.048	Cd I
40	2580.02	Er III	65	2588.78	Mo II	250	2593.70	Mo II	40	2602.14	Mn I
130	2580.03	Os II	4	2588.87	La III	100	2593.70	Ru I	2	2602.50	Mg I
120	2580.04	F III	200	2588.91	Co II	6200	2593.73	Mn II	75	2602.51	W II
50	2580.106	Cd I	30	2588.97	Mn II	60	2593.75	Nb III	30	2602.72	Mn II
700	2580.14	Tl I	230	2589.059	Th II	310	2594.25	Ta II	250	2602.80	Mo II
210	2580.16	Ta I	130	2589.07	Zr II	200	2594.42	Sn I	40	2602.93	Tb II
800	2580.32	Co II	500	2589.14	Br III	300 h	2594.48	Br III	75	2603.02	W II
290	2580.34	W I	390	2589.17	W II	200	2594.56	Rb II	70	2603.14	Pt I
15	2580.46	Ti III	28	2589.188	Ge I	10	2594.71	Eu III	320	2603.31	Cl II
870	2580.49	W I	300	2589.20	Tm III	20	2594.76	Eu III	30	2603.32	Rh II
1	2580.59	Mg I	20	2589.25	Au I	110	2594.85	Ru I	4500 c	2603.35	Lu III
600	2580.67	Cl III	15	2589.34	Sr IV	600	2594.96	Na II	600	2603.49	Ta II
50	2580.82	Ti I	2	2589.55	Er III	120	2595.03	Er II	270	2603.54	W I
360	2581.05	Os I	100	2589.57	Ru I	250	2595.10	V III	35	2603.57	Cr I
1000	2581.19	Br IV	22	2589.65	Zr I	9	2595.17	Sc IV	10000	2603.59	Ce III
40	2581.20	W II	45	2589.71	Mn II	560	2595.26	Ta I	500	2603.59	Cl III
100	2581.84	Tm III	200	2589.86	Tc I	100	2595.40	Mo I	100	2603.62	Er III
26	2581.86	Eu II	30	2590.04	Au I	130	2595.53	F III	45	2603.72	Mn II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
4	2603.85	Mg I	100	2609.855	Th II	160 c	2616.72	Re II	370	2623.69	Dy I
290	2603.89	Re I	500	2609.94	Ni II	30	2616.76	Pt II	400	2623.76	Rb II
50	2604.04	In II	1000 c	2609.99	Tc II	400	2616.78	Mo I	150	2624.04	Mn I
10	2604.44	Eu III	300	2610.03	Ne III	40	2616.90	Tb	140	2624.18	Er II
190	2604.55	Ir I	45	2610.07	Sm	100	2617.01	Yb II	50 h	2624.21	V IV
26	2604.61	Eu I	30	2610.09	Eu III	8	2617.15	Fe III	730	2624.33	Tm II
2	2604.83	La III	190	2610.20	Mn II	12	2617.17	Sb III	40	2624.80	Mn II
40	2604.91	Er III	400	2610.34	La II	10000	2617.17	Cm II	8	2624.82	Ga I
	2605.08	Li II	110	2610.51	Ho II	500	2617.22	Tm III	10	2624.86	Te II
40	2605.08	Mo II	400	2610.78	Os I	3	2617.51	Mg I	40 w	2624.91	Pr III
340	2605.15	Ti I	20	2611.07	Fe II	1	2617.63	Sb III	12	2624.92	Ar IV
20	2605.34	Fe II	200	2611.147	P III	30	2617.64	Er III	130	2625.01	F III
20	2605.42	Fe II	190	2611.20	Mo I	330	2617.78	Ir I	8	2625.19	Er III
250	2605.506	P IV	40	2611.22	Sc II	4	2617.97	Hg III	15	2625.19	Hg I
60	2605.657	Fe I	510	2611.28	Ti I	5	2617.99	Be II	60	2625.20	Ho II
4300	2605.69	Mn II	1800	2611.30	Ir I	250	2618.018	Fe I	400	2625.22	W I
100 p	2605.71	Co II	310 d	2611.34	Ta I	20	2618.13	Be II	22	2625.32	Cr I
10	2605.72	Te II	75	2611.48	Ti I	500	2618.14	Mn II	250	2625.32	Ir I
190	2605.86	Ho II	610 d	2611.54	Re I	30	2618.28	Tc I	30	2625.34	Pt II
40	2605.93	Mo II	850	2611.81	Na II	2500 r	2618.37	Cu I	1400	2625.48	Gd III
220	2606.02	Tm II	600	2611.87	Fe II	2	2618.40	Er III	50	2625.49	Fe II
150	2606.06	P II	830	2612.07	Ru I	500	2618.78	Tm III	200	2625.58	Mn II
5	2606.17	Kr IV	300 r	2612.31	Sb I	15	2618.81	Cd III	200	2625.67	Fe II
450 h	2606.20	Br III	100	2612.50	Co II	230	2618.91	Th II	270	2625.737	Th II
500	2606.26	Ni II	470	2612.63	Os I	2	2618.94	Er III	230	2625.88	Rh I
390	2606.37	Hf II	2	2612.92	Hg III	20	2619.07	Fe II	100	2626.08	Cr III
680	2606.39	W I	1800	2613.06	Os I	210	2619.18	W I	100	2626.18	P II
75	2606.44	Rh II	290	2613.08	Mo I	1800	2619.26	Lu II	20	2626.37	Er III
300	2606.51	Fe II	970	2613.08	W I	70	2619.34	Mo II	1000 h	2626.44	Ac III
5	2606.62	Mg I	500 h	2613.13	Br III	1200	2619.40	Gd III	500 h	2626.52	Br III
800	2606.827	Fe I	1	2613.36	Mg I	50	2619.57	Pt I	18	2626.60	Cr I
450	2607.03	Hf II	1800	2613.40	Lu II	210	2619.88	Ir I	95	2626.64	Mn I
810	2607.06	Tm II	240	2613.41	Ne III	800	2619.94	Os I	100	2626.76	Ir I
250	2607.37	Mo I	230	2613.60	Hf II	300	2619.94	Ti I	10	2626.98	Eu III
320	2607.38	W I	75	2613.60	Rh	6	2619.98	Ar IV	20	2627.02	Au II
5	2607.47	Ga I	500 r	2613.655	Pb I	400	2620.25	W I	300	2627.07	Yb III
190	2607.52	Ir I	480	2613.82	W I	25	2620.35	Sr IV	100	2627.09	Tm III
2000	2607.96	Ce III	95	2613.99	Ho II	250	2620.56	Zr III	300	2627.41	Na II
5000 c	2608.01	La IV	900 r	2614.175	Pb I	230	2620.62	Os I	130	2627.44	Nb I
10	2608.06	Ar IV	1	2614.20	Sb III	20	2620.69	Fe II	320	2627.55	Mo I
350 h	2608.15	Br III	1500	2614.23	Tc I	10	2620.79	Eu III	700	2627.91	Bi I
40	2608.24	Pm II	100	2614.36	Co II	15	2620.82	Ca III	25	2627.95	Cs II
700	2608.25	Ir I	25	2614.53	Er III	140	2621.07	Mo I	20	2627.96	Te II
370	2608.32	W I	2	2614.73	Mg I	7	2621.11	Kr IV	1100	2628.03	Pt I
30	2608.34	Eu III	210	2614.98	Ir I	600	2621.11	Yb III	2000	2628.10	Gd III
2 c	2608.38	Pb II	500	2615.06	Ni II	1000	2621.12	Tm III	50	2628.24	Pd II
7	2608.44	Ar IV	100	2615.09	Ru I	20	2621.16	Sr IV	210	2628.26	W I
120	2608.45	Hf I	230	2615.12	W I	50	2621.28	Zr III	60	2628.26	Zr III
660	2608.50	Re II	21	2615.26	Yb II	400	2621.35	Tm III	160	2628.262	Pb I
200	2608.56	Zn I	8	2615.3	Kr IV	12	2621.36	Ar IV	150	2628.29	Fe II
110	2608.57	Tb II	130	2615.39	Mo I	1200	2621.52	Gd III	20 c	2628.46	Eu III
1400	2608.63	Ta I	18000	2615.42	Lu II	40	2621.67	Fe II	380	2628.48	Os I
300	2608.64	Zn I	70	2615.44	W II	530	2621.82	Os I	130	2628.49	Nb I
75	2608.69	Dy II	340	2615.46	Ta I	5	2621.92	Te II	3	2628.66	Mg I
500	2608.86	Tc I	310	2615.66	Ta I	400	2622.21	W I	50	2628.67	Nb III
25	2608.92	Pr II	12	2615.68	Ar IV	400	2622.31	Tm III	130	2628.69	Tb II
500	2608.96	Tm III	25	2615.75	Pr II	150	2622.58	Rh I	160	2628.74	Mo I
60	2608.99	Tl I	2000	2615.79	Ce III	35	2622.69	Sr III	100 p	2628.77	Co II
210	2609.00	Ta I	200	2615.87	Ne III	450	2622.74	Hf II	55	2628.812	Th II
370	2609.06	Ru I	1000	2615.87	Tc I	200	2622.76	Re I	10	2628.82	Eu III
30	2609.14	Yb III	50 c	2616.11	Eu III	35	2622.86	Cr I	100	2628.83	Tm III
210	2609.20	Os I	350 h	2616.26	Br III	140	2622.90	Mn I	50	2628.979	Cd I
500	2609.32	Cu III	20	2616.26	Eu III	80	2623.11	Ne II	1300	2628.99	Gd III
45	2609.43	Zr I	130	2616.27	Cs II	20	2623.33	Eu III	100	2629.	Bi IV
250	2609.44	Cs II	10	2616.33	Eu III	270	2623.448	Th II	20	2629.1	S II
10	2609.5	Kr IV	10	2616.35	Eu III	130	2623.51	Nb I	350 h	2629.23	Br III
380	2609.56	Os I	50	2616.40	Au II	1400	2623.52	Gd III	140	2629.70	F III
300	2609.66	Tm III	130	2616.48	Nb I	400	2623.53	Fe I	18	2629.82	Cr I
1800	2609.77	Gd III	80	2616.50	Cr III	70	2623.64	Ir II	2400	2629.83	Gd III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
440	2629.85	Mo I	330	2636.67	Mo II	85	2641.89	Yb II	28	2647.46	Yb II
80	2629.89	Ne II	170	2636.67	Ru I	5	2642.11	I IV	2400	2647.47	Ta I
6	2630.05	Mg I	470	2636.67	Ta I	4	2642.11	I III	50	2647.50	Cr III
20	2630.07	Fe II	200	2636.68	Tm III	35	2642.12	Cr I	330	2647.50	Nb I
30	2630.26	Mn I	90	2636.76	P II	110	2642.15	Dy I	380	2647.73	Os I
100	2630.42	Rh I	350	2636.83	Rb III	20	2642.16	Sr IV	75	2647.74	W II
5	2630.56	Cd III	70	2636.9	S III	130	2642.21	V II	55	2647.78	Zr I
60	2630.57	Mn I	860	2636.90	Ta I	200	2642.24	Nb II	130	2648.07	Cs II
140	2630.67	V II	50 h	2636.94	Sn I	30 c	2642.27	Eu III	65	2648.46	Re II
150	2630.91	Zr II	160	2637.00	Hf I	100	2642.37	Tc I	25	2648.48	Pr II
250	2631.05	Fe II	200	2637.01	Po	1000	2642.56	Yb III	20	2648.48	Te II
27	2631.22	Os II	190	2637.01	Re II	160	2642.75	Hf I	30	2648.51	Sr III
190	2631.282	Si I	3800	2637.13	Os I	270	2642.75	Re I	160	2648.53	Na II
220	2631.30	Ru I	80	2637.14	Cs II	460	2642.96	Ru I	770	2648.64	Co I
250	2631.32	Fe II	1700	2637.15	Gd III	30	2642.96	Sr III	28	2648.80	Yb II
170	2631.54	Ti I	200	2637.30	Tm III	75	2643.00	Rh I	270	2649.05	Re I
80	2631.55	Al II	4	2637.52	Er III	70	2643.40	Zr II	4	2649.06	Mg I
50	2631.61	Fe II	110	2637.70	Al II	500	2643.58	Tm III	35	2649.17	Sm
1000	2631.75	Rb III	200	2637.77	Er III	100	2643.62	Yb III	300 c	2649.21	Tc I
5	2631.78	Ge IV	2100	2637.97	Gd III	2100	2643.71	Gd III	200	2649.27	Tm III
300	2631.81	Na II	2100	2638.06	Gd III	10	2643.73	Ra II	30	2649.30	Ti I
7	2631.90	Ar III	500	2638.06	Yb III	200	2643.79	Zr III	380	2649.34	Os I
10	2631.98	Eu III	130	2638.17	Mn II	200	2643.92	Cu III	2000	2649.38	Ce III
150	2632.00	Pm II	80	2638.29	Ne II	200	2643.998	Fe I	640	2649.46	Mo I
40	2632.190	Cd I	250	2638.30	Mo I	80	2644.10	Ne II	240	2649.52	Nb I
100	2632.237	Fe I	70	2638.46	Pm II	1900	2644.11	Os I	100	2649.66	Te II
100	2632.26	Co II	400 d	2638.62	W I	8	2644.184	Ge I	60	2649.68	Ho II
2100	2632.30	Gd III	200	2638.70	Ne III	210	2644.19	Ir I	50	2649.79	Yb II
190	2632.35	Mn II	1100	2638.71	Hf II	800	2644.26	Ti I	160	2650.27	Tm II
170	2632.42	Ti I	30	2638.74	Rh II	400	2644.295	P IV	110	2650.38	Zr II
400	2632.48	W I		2638.75	W I	110	2644.31	Yb II	100	2650.45	Be I
10	2632.66	Ga I	720	2638.76	Mo II	600	2644.35	Mo II	60	2650.55	Be I
500	2632.67	Cl III	1000	2638.77	Eu II	40	2644.50	Tc II	170	2650.583	Th II
400	2632.70	W I	210	2639.09	Zr II	1600	2644.52	Gd III	200	2650.62	Be I
300	2632.713	P III	130	2639.35	Pt I	20 w	2644.62	Pr III	60	2650.69	Be I
8	2632.87	Mg I	250	2639.42	Ir I	25	2644.69	Cs II	28	2650.73	Yb II
810	2633.13	W I	75	2639.420	Cd I	2	2644.80	Mg I	100	2650.76	Be I
80	2633.17	Nb III	45	2639.45	Yb II	100	2645.05	Tm III	100	2650.82	Tm III
500	2633.18	Cl III	350 h	2639.60	Br III	20	2645.22	Eu III	500	2650.86	Pt I
100	2633.22	Pd III	3500	2639.71	Ir I	150	2645.26	V I	20 c	2650.93	Eu III
1800	2633.32	Gd III	60	2639.76	Kr III	110	2645.35	Dy II	27	2650.99	Mn II
15	2634.14	Ca III	5	2639.78	Hg I	300	2645.36	Po I	340	2651.01	Ce II
700	2634.17	Ir I	80	2639.84	Mn II	9 p	2645.39	Fe III	100	2651.16	Hf II
4	2634.256	Pb II		2640.	Li	470	2645.47	U II	10000	2651.17	Cm II
55	2634.31	Yb II	80	2640.09	Ho I	80 h	2645.54	V IV	1200	2651.172	Ge I
300	2634.66	Tm III	90	2640.27	Sm	400	2645.58	Rb II	270	2651.22	Ta II
100	2634.78	Ba II	80	2640.30	Ho II	250	2645.65	N IV	110	2651.29	Ru I
440	2634.80	Dy II	100	2640.32	Tm III	210	2645.69	W I	200	2651.31	Na II
200	2634.91	Tc II	110	2640.33	Ru I	1800	2646.04	Gd III	1600	2651.48	Gd III
40	2634.99	Rh I	15	2640.34	Ar IV	300	2646.18	N IV	5	2651.49	Er III
5	2635.11	K III	300	2640.48	Yb III	650	2646.18	W I	400	2651.50	La III
170	2635.27	Ir I	2200	2640.53	Gd III	3	2646.21	Mg I	500	2651.568	Ge I
30	2635.37	Yb III	100	2640.73	Cr III	510	2646.22	Ta I	200	2651.71	Cs II
80	2635.42	Zr I	210	2640.76	Tm II	320	2646.26	Nb II	1000	2651.74	Yb III
30	2635.50	Eu II	4	2640.77	I III	600	2646.37	Ta I	330	2651.84	Ru I
610	2635.53	U II	4	2640.77	I IV	310	2646.42	Co I	660	2651.90	Re I
1200	2635.58	Ta II	11	2640.79	Si III	28	2646.44	Yb II	140	2651.90	V I
1400	2635.71	Gd III	410	2640.99	Mo I	130	2646.45	Tm II	250	2652.04	Hg I
300	2635.809	Fe I	90	2641.02	Re II	370	2646.49	Mo II	250	2652.043	Hg I
310	2635.83	Re II	200	2641.07	Ne III	950	2646.64	Ti I	8	2652.23	I IV
220	2635.86	Ru I	640	2641.10	Ti I	400	2646.73	W I	6	2652.25	I III
70	2635.92	Pd II	30	2641.26	Tc I	1800	2646.84	Gd III	700	2652.25	Yb III
100	2636.07	Co II	380	2641.27	Eu II	340	2646.89	Os I	100	2652.35	Tc II
90 w	2636.07	Ne II	1100	2641.41	Hf II	1000	2646.89	Pt I	150	2652.48	Al I
10000	2636.28	Cm II	250	2641.48	Au I	350	2646.96	N IV	200 r	2652.60	Sb I
80	2636.36	Tc I	270	2641.488	Th II	1000 c	2647.01	Tc II	400	2652.66	Rh I
1600	2636.44	Gd III	50	2641.646	Fe I	110	2647.28	Rh I	10	2653.19	Eu III
290	2636.54	W I	1600	2641.65	Gd III	670	2647.29	Hf II	2600	2653.27	Ta I
550	2636.64	Re I	20	2641.89	Te II	110	2647.32	Ru I	480	2653.35	Mo II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
40	2653.42	W II	30	2659.01	Rh I	600	2665.54	Cl III	1000	2671.83	Na II
30	2653.57	Tc I	40	2659.23	Cd II	80	2665.57	Tl I	520	2671.84	Ir I
80	2653.57	W II	21	2659.27	Yb II	220	2665.60	Ta II	400	2671.93	Nb II
250	2653.59	Cr II	2800	2659.45	Pt I	440	2666.02	Cr II	390	2671.96	Yb I
40	2653.61	Eu II	400	2659.62	Ru I	2000	2666.13	Yb III	290	2672.00	V II
400	2653.683	Hg I	200	2659.81	Na II	80	2666.24	Ho II	1	2672.19	Si IV
400	2653.69	Hg I	640	2659.83	Os I	200	2666.291	Cu II	330	2672.25	Er II
100	2653.72	Co II	3	2659.87	Ga I	350	2666.46	Na II	10	2672.46	Mg I
990	2653.75	Yb II	100	2659.98	Yb III	75	2666.49	W II	20	2672.52	Pr II
170	2653.76	Ir I	250	2660.09	Tm II	110	2666.59	Nb II	110	2672.59	Mn II
10000	2653.80	Cm II	25	2660.24	Cs II	30	2666.64	Fe II	50	2672.62	Cd II
100	2654.05	Tm III	50 h	2660.325	Cd I	25	2666.70	Pr II	390	2672.66	Yb II
400	2654.12	Re I	200	2660.39	Al I	200	2666.73	Co II	280	2672.83	Cr II
100	2654.31	Tc I	60	2660.49	Ag II	30	2666.77	Mn II	720	2672.84	Mo II
330	2654.45	Nb I	640	2660.58	Mo II	300	2666.812	Fe I	40	2673.24	Cs II
10	2654.63	Ar III	8	2660.76	Mg II	20 c	2666.86	Eu III	250	2673.27	Mo II
35	2654.66	Sr III	8	2660.82	Mg II	1000	2666.93	Tm III	30	2673.33	Yb III
90 d	2654.70	In II	2200	2660.83	Gd III	60	2666.965	Fe I	55	2673.37	Mn II
30	2654.75	Pr II	120	2660.88	Tc I	2000	2666.99	Yb III	110	2673.42	Eu II
15	2654.93	Ti I	850	2661.00	Na II	45	2667.00	Mn I	200	2673.57	Nb II
560 h	2655.03	Mo I	80	2661.10	Te II	30	2667.03	Mn II	80	2673.59	W II
10	2655.09	Eu III	23	2661.17	Ru II	110	2667.30	Nb II	330	2673.61	Ir I
100	2655.13	Hg I	380	2661.18	Os I	30	2667.40	Ru II	8	2674.02	Ar III
100	2655.130	Hg I	200 r	2661.24	Sn I	20 w	2667.51	Pr III	200	2674.04	Na II
40	2655.28	Cr III	1500	2661.34	Ta I	55	2667.64	Tb II	40	2674.13	Tb II
50 h	2655.41	V IV	600	2661.40	Br IV	180	2667.80	Zr II	940	2674.34	Re I
14	2655.51	Si III	50	2661.40	Tb II	110	2667.94	Dy I	55	2674.43	Mn II
2000	2655.59	Gd III	180	2661.42	V I	220	2668.07	Ta I		2674.46	Li II
60	2655.91	Mn II	28	2661.50	Gd II	6	2668.12	Mg I	140 d	2674.56	In II
55	2655.96	Tb II	500	2661.51	Tm III	25	2668.20	Cd II	580	2674.57	Os I
310	2656.08	Nb II	330	2661.61	Ru II	140	2668.20	Tm II	40	2674.57	Pt I
35	2656.12	Yb II	24	2661.64	Tb II	20 c	2668.21	Eu III	40	2674.69	Tb II
150	2656.22	V I	70	2661.73	Cr II	130	2668.29	Nb I	400	2674.88	Os I
28	2656.25	Ru II	210	2661.88	Hf II	640	2668.34	Eu II	5	2674.91	Hg I
100	2656.30	Tm III	85	2661.97	Ti I	200	2668.59	Tm III	4	2675.12	Si IV
120	2656.44	F III	1800	2661.98	Ir I	600	2668.62	Ta I	120	2675.15	Sm
100	2656.46	Zr III	10	2662.24	Eu III	140 d	2668.65	In II	4	2675.25	Si IV
1600	2656.54	W I	100	2662.30	Tc I	100	2668.66	Tm III	100	2675.30	Tm III
12	2656.55	Sb II	70	2662.42	Sm	280	2668.71	Cr II	100	2675.35	Er II
1900	2656.55	Gd III	350	2662.63	Ir I	55	2668.75	Yb II	1800	2675.75	Gd III
1900	2656.61	Ta I	100 d	2662.63	In II	50	2668.86	Tb II	100	2675.85	Co II
490	2656.68	Os I	70000 w	2662.75	La IV	80	2668.98	Xe III	770	2675.90	Ta II
100	2656.68	Rb III	2000	2662.81	Ce III	140	2668.99	Ir I	200	2675.94	Nb II
100	2656.81	Ir I	810	2662.84	W I	160	2669.17	Al II	3400	2675.95	Au I
50 h	2656.87	V IV	1000	2663.00	Tm III	340	2669.17	U II	40 c	2676.09	Eu III
20 w	2656.88	Pr III	700	2663.154	Pb I	200	2669.18	Tm III	65	2676.11	Rh I
90	2657.05	Lu	700 h	2663.33	Po	140	2669.29	Tb II	30	2676.33	Mn I
10	2657.094	Pb I	320	2663.42	Cr II	210	2669.30	W I	1000	2676.64	Tm III
35	2657.19	Ti I	200	2663.46	Na II	20	2669.39	Sb III	120	2676.83	Ir I
2	2657.29	Li II	100	2663.53	Co II	55	2669.49	Zr II	55	2676.84	Dy II
3	2657.30	Li II	220	2663.63	Re I	8	2669.55	Mg I	500	2676.91	Tm III
400	2657.38	W I	70	2663.68	Cr II	95	2669.60	Ti I	750	2676.95	Cl II
160	2657.62	Nb I	150	2664.26	Zr III	130	2669.79	Cs II	100	2677.	Bi IV
45	2657.68	Sm	40	2664.29	Os II	520	2669.91	Ir I	110	2677.13	Te I
40	2657.70	Te II	60	2664.66	Fe II	40	2670.0	S II	440	2677.15	Pt I
2700	2657.80	Lu II	200	2664.76	Ru I	490	2670.26	Er II	1800	2677.16	Cr II
160	2657.84	Hf II	500	2664.76	Tm III	3	2670.49	Hg III	90 h	2677.25	Lu I
80	2657.99	Nb III	2700	2664.79	Ir I	200	2670.53	Zn I	650	2677.28	W I
400 d	2658.04	W II	500	2664.88	Tm III	300 r	2670.64	Sb I	50	2677.34	Dy II
290	2658.11	Mo I	70	2664.89	Yb III	120	2670.96	Zr II	500	2677.39	Yb III
20	2658.17	Pt I	2	2664.93	Sn II	100	2671.05	Pm II	100	2677.540	Cd I
	2658.18	W I	260	2664.97	W I	30	2671.06	Rh I	1	2677.57	Si IV
190	2658.48	Tm II	200	2665.04	Yb II	15	2671.17	Cs II	25	2677.748	Cd I
250	2658.59	Cr II	10	2665.05	Ga I	100	2671.42	Tm III	160 d	2677.79	W II
1900	2658.60	Os I	200	2665.05	Tm III	810	2671.47	W I	380	2677.80	V II
150	2658.663	Th II	110	2665.10	Mo I	350 h	2671.53	Br III	600	2677.90	Ne III
70	2658.69	Zr I	110	2665.25	Nb II	200	2671.67	Po I		2677.91	W I
950	2658.72	Cl II	220	2665.4	S III	350	2671.81	Cr II	8	2678.01	Sc IV
150	2658.75	Pd II	360	2665.5	Se IV	55	2671.83	Mo II	850	2678.09	Na II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
29	2678.15	Tb II	1000	2684.10	Rb II	280	2691.04	Cr II	120	2696.99	V I
35	2678.16	Cr I	880	2684.14	Mo II	320	2691.04	U II	1000	2697.06	Nb II
100	2678.28	Tm III	300	2684.16	Zn I	210	2691.09	W I	2800	2697.39	Gd III
250	2678.29	Eu II	19	2684.23	Sc II	8	2691.29	Ga I	68	2697.42	Ta IV
9	2678.38	Ar III	600	2684.28	Ta I	340	2691.31	Ta I	5	2697.46	Be II
270	2678.57	V II	360	2684.288	Th II	500	2691.341	Ge I	170	2697.50	Tm II
1800	2678.63	Zr II	100	2684.42	Co II	160	2691.77	Nb II	10	2697.541	Pb I
500	2678.64	Ne III	55	2684.55	Mn II	110	2691.8	S III	20	2697.58	Be II
690	2678.76	Ru II	500	2684.75	Fe II	50	2691.90	Tb II	210	2697.71	W II
320	2678.79	Cr II	70	2684.75	Yb II	550	2692.03	Eu II	120	2697.74	V I
400	2678.88	W I	150	2684.76	La III	330	2692.06	Ru II	150	2697.75	C III
600	2679.062	Fe I	26	2684.80	Ti I	10	2692.16	Ti III	35	2697.91	Cr II
380	2679.32	V II	570 h	2685.08	Lu I	120	2692.25	Sb I	3	2698.08	Ge IV
1800	2679.44	Gd III	30	2685.14	Ti I	270	2692.34	Ir I	6	2698.14	Mg I
70 w	2679.47	Pr III	1500	2685.17	Ta II	260	2692.40	Ta I	400	2698.21	Tm III
310	2679.57	Tm II	30	2685.19	Pr II	480	2692.415	Th II	1000	2698.30	Ta I
1000	2679.85	Mo I	90 h	2685.54	Lu I	60	2692.60	Fe II	60	2698.31	Zr III
130	2679.93	Ti I	250	2685.66	Eu II	90	2692.60	Zr II	180	2698.41	Cr II
270	2680.06	Ta II	45	2685.70	Pr II	30	2692.61	Mo II	200	2698.43	Pt I
200	2680.133	P III	55	2685.94	Mn II	85	2692.66	Mn I	180	2698.69	Cr II
25	2680.28	Rh I	20	2686.13	Eu III	1600	2692.78	Gd III	50	2698.83	Hg I
30	2680.32	Kr III	75	2686.28	Zr III	120	2692.78	Sc I	50	2698.831	Hg I
18	2680.34	Cr II	220	2686.29	Ru I	85	2692.83	Dy II	320	2698.86	Nb II
45	2680.34	Mn II	30 h	2686.50	Rh	1900	2692.86	Gd III	50	2698.92	Pr II
21	2680.40	Yb II	130	2686.60	Cs II	22	2692.92	Zr I	27	2698.97	Mn II
100	2680.49	Tm III	12	2686.72	Ca III	12	2693.0	Bi II	350	2699.07	Sc III
70	2680.5	S III	30 h	2686.91	Rh	35	2693.05	Tb II	200	2699.106	Fe I
1700	2680.63	Gd III	230	2687.09	Cr II	80	2693.11	Tc I	3000	2699.22	Pa II
100	2680.63	Rh I	300	2687.14	Tm III	27	2693.19	Mn II	50	2699.38	Hg I
220	2680.66	Ta II	130	2687.15	Nb I	130	2693.34	Sm	55	2699.41	Mo II
30	2680.68	Mn II	200	2687.22	Hf III	55	2693.41	Tb II	1000	2699.49	Tm III
50	2680.692	Th I	28	2687.50	Ru II	40 c	2693.51	Eu III	510	2699.59	Os I
40	2681.19	Kr III	80	2687.53	O III	35	2693.52	Cr II	650	2699.59	W I
80	2681.19	Tc II	20	2687.63	Au II	160	2693.53	Zr II	95	2699.60	Zr II
30	2681.25	Mn II	20 c	2687.74	Eu III	3	2693.72	Mg I	1000	2699.80	Tm III
95	2681.36	Mo II	90	2687.75	Zr I	45	2693.74	Sm	20	2699.87	Eu III
2100	2681.42	W I	16	2687.76	Ca III	10	2693.98	F V	400	2700.01	W I
20	2681.65	Y I	35	2687.82	Tb II	100	2693.99	Th IV	8 h	2700.02	Fe III
40	2681.72	Mn I	1100	2687.96	V II	180	2694.06	Zr II	750	2700.13	Zr II
35	2681.76	Zr II	25	2687.98	Yb II	60	2694.21	Y I	60	2700.38	Pr II
30	2681.78	Rh I	560	2687.99	Mo II	3000	2694.23	Ir I	20	2700.47	Ga II
40	2681.89	Ba III	60	2688.04	Cr I	50	2694.31	Rh I	18	2700.60	Cr I
100	2682.16	Zr III	1200	2688.04	Cl II	1500	2694.43	Gd III	20 c	2700.78	Eu III
250 w	2682.18	N III	20	2688.16	Au II	470	2694.52	Ta II	18	2700.80	Yb II
10 h	2682.21	Si II		2688.16	Ru II	10	2694.80	Eu III	80	2700.89	Au I
5000	2682.32	Tm III	110	2688.25	Mn II	10 h	2695.13	Fe III	680	2700.94	V II
100	2682.34	La III	55	2688.29	Cr II	5	2695.18	Mg I	700	2700.962	Cu II
1800	2682.52	Gd III	220	2688.53	Re I	55	2695.22	Mo II	85	2701.00	Mn II
9	2682.63	Ar IV	100	2688.60	Sm	9 h	2695.34	Fe III	140	2701.03	Mo I
300	2682.64	Tm III	30	2688.71	Au I	55	2695.36	Mn II	8 h	2701.13	Fe III
200 r	2682.76	Sb I	170	2688.72	V II	26	2695.39	Y I	700	2701.14	Eu II
180	2682.87	V II	65	2688.82	Ti I	28	2695.43	Yb II	50	2701.17	Mn II
50 h	2682.90	Ac III	200 c	2688.98	I II	70	2695.43	Zr II	15	2701.19	Cs II
45	2683.02	Mn I	70	2689.03	Ho II	35	2695.46	Tb II	110	2701.34	Ru I
180	2683.09	V II	90	2689.20	N III	110	2695.49	O III	400	2701.36	Cl IV
25	2683.10	Er III	400	2689.212	Fe I	100	2695.553	Th II	480	2701.42	Mo II
80	2683.12	In II	750	2689.300	Cu II	650	2695.67	W I	40	2701.48	W II
60	2683.14	Tc I	85	2689.31	Dy II	300	2695.69	Tm III	160	2701.70	Mn II
20 c	2683.21	Eu III	25	2689.41	Cs II	120	2696.07	Ce II	4200	2701.71	Lu II
640	2683.23	Mo II	2100	2689.82	Os I	60	2696.08	Sm	30	2701.87	Mo II
470	2683.28	U II	150	2689.88	V II	50	2696.28	Fe I	800	2701.90	Eu II
290	2683.35	Hf II	5	2689.90	K III	200	2696.38	Cu III	12	2701.96	Ti III
290	2683.35	W I	350	2690.17	Br II	45	2696.49	Ni I	110	2701.99	Cr I
14	2683.42	Yb II	230	2690.24	V II	14	2696.62	Yb II	100	2702.02	Co II
23	2683.75	Mn I	26	2690.26	Cr I	50	2696.64	Tc I	160	2702.11	W II
80	2683.89	Tc I	70	2690.49	Zr III	280 c	2696.76	Bi I	380	2702.19	V II
1500	2683.91	Gd III	240	2690.79	V II	240	2696.81	Ta I	320	2702.20	Nb II
40	2683.97	Tb II	45	2690.90	Sm II	30	2696.83	Mo II	30	2702.25	Pr II
110	2684.04	Ir I	500	2691.01	Yb III	50	2696.83	Tb II	70	2702.27	Tc I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
10	2702.30	F V	170	2708.176	Th II	20	2714.16	Pr II	1500	2720.903	Fe I
2000	2702.40	Pt I	10 c	2708.25	Eu III	120	2714.20	V II	540	2721.19	Tm II
75	2702.46	Nd	110	2708.45	Mn II	140	2714.26	Zr II	110	2721.4	S III
150	2702.52	Nb II	60	2708.571	Fe I	80	2714.41	Fe II	7	2721.65	Ca I
210	2702.52	W I	400	2708.59	W I	75	2714.41	Rh I	200	2721.65	Lu III
18	2702.53	Cr I	1000	2708.78	Tc I	3000	2714.64	Os I	300	2721.677	Cu II
8	2702.63	Ba I	60	2708.79	Cr II	2600	2714.67	Ta I	230	2721.691	Th II
110	2702.8	S III	400 d	2708.80	W I	30	2715.20	Tc I	60	2721.77	Ag I
110	2702.83	Ru I	20 c	2708.84	Eu III	100	2715.31	Rh II	850	2721.86	Os I
1500	2702.91	Gd III	21	2708.84	Yb II	580	2715.36	Os I	30	2721.90	Pr II
40	2702.96	Tc II		2708.93	W I	1300	2715.47	Re I	470	2721.98	Nb II
650	2703.184	Cu II	20	2708.96	Ra II	400	2715.50	W I	30	2722.10	Mn II
2800	2703.28	Gd III	55	2709.01	Dy II	640	2715.69	V II	21	2722.20	Yb II
70	2703.48	Cr I	20	2709.05	Fe II	45	2715.76	Zr III	170	2722.380	Th II
	2703.55	Cr II	50	2709.05	Zr III	200	2715.81	Tm III	40	2722.47	Sr III
100	2703.63	Tm III	170	2709.20	Ru I	90 h	2715.91	Lu I	150	2722.56	V I
200	2703.68	Tm III	420	2709.23	Tl I	190	2715.99	Co I	1300	2722.61	Zr II
400	2703.73	Rh I	310	2709.27	Ta II	45	2716.18	Cr I	130	2722.65	Ru I
35	2703.86	Cr II	35	2709.31	Cr II	50	2716.22	Fe II	170	2722.75	Cr II
270	2703.958	Th II	80	2709.58	W II	26	2716.25	Ti II	95	2723.00	Y I
10	2703.96	F V	850	2709.624	Ge I	50	2716.257	Fe I	1	2723.19	He I
100	2703.98	Mn II	1000	2709.74	Tm III	80	2716.32	W II	400	2723.29	Er III
60	2703.99	Fe II	160	2709.84	N II	470	2716.62	Nb II	120	2723.38	Ce II
200	2704.03	Ge II	45	2709.96	Mn II	30	2716.80	Mn II	8	2723.52	Sc IV
110	2704.03	Ir I	180	2709.99	Eu I	700	2716.98	Eu II	30	2723.55	Tc I
190	2704.07	Tb II	1200	2710.13	Ta I	240	2717.18	Ta I	400	2723.578	Fe I
1600	2704.53	Gd III	40	2710.19	Mo II	100	2717.33	Xe III	3 h	2723.81	Si IV
75	2704.54	Nd	1600	2710.26	In I	1800	2717.35	Gd III	70	2723.96	Eu I
15	2704.86	Ca III	40 w	2710.30	Pr III	290	2717.35	Mo II	500	2724.03	Cl IV
30	2704.93	Mo II	100 p	2710.30	Y III	15	2717.44	Ge IV	100 w	2724.03	Pr III
100	2704.93	Tm III	80	2710.33	Mn II	55	2717.51	Cr II	18	2724.04	Cr II
500 c	2705.19	Pr IV	700	2710.37	Cl III	75	2717.51	Rh I	130	2724.21	Cs II
240	2705.28	Eu II	65	2710.54	Yb II	30	2717.53	Mn II	285	2724.3	Se IV
80	2705.36	Hg II	90 h	2710.54	Y III	300	2717.56	Tm III	2600	2724.35	W I
18	2705.43	Cr I	50 h	2710.67	Tl I	50	2717.786	Fe I	110	2724.41	Mo I
670	2705.61	Hf I	40	2710.78	W II	50	2717.87	Fe II	70	2724.43	Hg III
40	2705.63	Rh II	200	2710.79	Tm III	100	2718.02	Tm III	3000	2724.44	Tm III
130	2705.74	Mn II	580	2711.35	Sc I	80	2718.04	W II	30	2724.46	Mn II
1600	2705.89	Pt I	30	2711.49	Mo II	170	2718.35	Yb II	210	2724.62	W I
80	2706.012	Fe I	280	2711.51	Zr II	45	2718.43	Cr II	300	2724.764	P IV
530	2706.17	V II	110	2711.58	Mn II	250	2718.436	Fe I	10	2724.84	Ar III
100 s	2706.35	Am II	20	2711.58	Te II	180	2718.54	Rh I	110 l	2724.85	C III
700 r	2706.51	Sn I	200	2711.655	Fe I	250	2718.59	Hf I	30	2724.88	Fe II
400	2706.58	W I	170	2711.74	V II	20 w	2718.65	Pr III	150	2724.953	Fe I
400	2706.582	Fe I	1000	2711.76	Rb II	650	2718.778	Cu II	400	2725.03	W I
200	2706.62	Co II	25	2711.78	Yb II	220	2718.9	S III		2725.06	W I
470	2706.69	Ta I	10	2712.08	Eu III	150 r	2718.90	Sb I	85	2725.07	Ti I
580	2706.70	Os I	140	2712.31	Cr II	2100	2718.91	W I	180	2725.15	Mo I
150	2706.70	V II	400	2712.32	Yb III	30	2719.01	Mn II	150 l	2725.30	C III
110	2706.73	Hf II	50	2712.35	Mo II	4000	2719.027	Fe I	140	2725.47	Ru II
360	2706.77	Sc I	80 h	2712.40	Kr II	1300	2719.04	Pt I	140	2725.47	Zr I
120	2706.88	Ce II	200	2712.41	Ru II	180 d	2719.09	Lu I	50	2725.52	In III
370	2706.95	U II	210	2712.42	Hf II	3000	2719.30	Ce III	20 c	2725.54	Eu III
50	2707.00	Cd II	140	2712.42	Zr II	320	2719.33	W I	10000	2725.68	Cm II
2000	2707.03	Tm III	300	2712.49	Zn I	100	2719.420	Fe I	150 l	2725.90	C III
20	2707.17	F V	20	2712.50	Ac II	3000	2719.47	Tm III	80	2726.05	Fe I
300	2707.19	Tm III	75	2712.505	Cd I	690	2719.52	Ru I	80	2726.15	In III
40	2707.23	Rh I	55	2712.66	Yb II	3	2719.66	Ga I	10	2726.23	Ac II
200	2707.35	Co II	160	2712.74	Ir I	50	2719.74	Mn II	50	2726.235	Fe I
100 h	2707.37	Pr II	60	2713.13	Pt I	210	2719.86	W I	800	2726.49	Zr II
200	2707.44	Tm III	20	2713.3	Bi II	1300	2720.04	Os I	50	2726.50	Pr II
80	2707.53	Mn II	1000	2713.38	Tm III	40	2720.07	Zr III	420 h	2726.51	Cr I
500	2707.60	Tm III	700	2713.508	Cu II	65	2720.14	Rh I	1000	2726.69	Tc I
110	2707.86	V II	190	2713.51	Mo II	60	2720.17	Pr II	220	2726.8	S III
100	2707.90	Tc II	210	2713.65	Ho II	50	2720.197	Fe I	85	2726.97	Mo II
210	2707.95	Sc I	400	2713.77	Br II	70	2720.50	Gd II	55	2727.17	Dy II
85	2707.96	Sm	140	2713.84	Hf I	30	2720.52	Rh I	45	2727.26	Cr II
200 c	2708.01	Pr IV	100	2713.86	Rb III	50 c	2720.67	Eu III	25	2727.38	Fe II
30	2708.04	Yb III	300	2713.94	In I	470	2720.76	Ta I	75	2727.42	Ti I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
470	2727.44	Ta II	170	2733.26	Ti I	250	2739.872	P IV	10000	2748.04	Cm II
80	2727.54	Fe II	12	2733.30	He II	70	2740.10	Cr II	18	2748.04	Yb II
4000	2727.56	Tm III	300	2733.34	O II	200	2740.223	P IV	8	2748.18	Kr IV
100	2727.78	Co II	250	2733.39	Mo I	40	2740.426	Ge I	250	2748.23	Cs II
4200	2727.78	Eu II	10	2733.49	Mg I	110	2740.51	Zr II	1100	2748.25	Au I
410	2727.78	Ta I	1000	2733.581	Fe I	160	2740.62	Eu II	110 h	2748.29	Cr I
2	2727.82	Sn II	50	2733.820	Cd I	85	2740.70	Dy II	1000	2748.54	Cd II
2700	2727.89	Gd III	25	2733.88	Cs II	75	2740.79	W II	230	2748.66	Yb II
200	2728.020	Fe I	230	2733.95	Ho II	110	2741.0	S III	20	2748.71	Au II
200	2728.13	Tm III	1800	2733.96	Pt I	250	2741.01	Rb II	1200	2748.78	Ta I
0	2728.24	Li II	370	2733.97	U II	95	2741.07	Cr I	650	2748.84	W I
5	2728.29	Li II	60	2734.005	Fe I	5	2741.20	Li I	200	2748.85	Nb I
2	2728.32	Li II	230	2734.05	Sc III	350 l	2741.28	C II	4000	2748.90	Ce III
30 c	2728.47	Tc I	21	2734.09	Yb II	40	2741.32	Mo II	330	2748.98	Cr II
55	2728.61	Mn II	50	2734.268	Fe I	8	2741.41	Er III	40	2749.06	Ti I
240	2728.64	V II	50	2734.30	Pr II	140	2741.55	Zr II	100	2749.32	Fe II
100 s	2728.69	Am II	310	2734.35	Ru II	55	2741.62	Mo II	500	2749.48	Fe II
400	2728.770	P IV	80	2734.54	Co II	55	2741.71	Yb II	100	2749.530	Th II
50	2728.820	Fe I	22	2734.85	Y II	75	2741.75	Rh I	130 d	2749.75	In II
20	2728.88	Be II	1400	2734.86	Zr II	110	2741.96	Ce II	860	2749.83	Ta I
80	2728.90	Fe II	80	2735.25	Eu I	95	2742.03	Cr II	80	2749.84	Cs II
160	2728.94	Rh I	55	2735.29	Ti I	40	2742.12	Pr II	500	2749.91	Yb III
480 h	2728.95	Lu I	500	2735.475	Fe I	95	2742.17	Cr I	1200	2750.140	Fe I
200	2729.120	P IV	40	2735.61	Ti I	250	2742.254	Fe I	310	2750.19	Er II
250	2729.327	Th II	50	2735.612	Fe I	250	2742.32	Ti I	430	2750.22	Gd II
190	2729.33	Eu II	1800	2735.72	Ru I	800	2742.405	Fe I	270	2750.35	Ho II
380	2729.44	Eu II	75	2735.76	Zr III	70	2742.53	Y I	1300	2750.48	Yb II
85	2729.50	Dy II	55	2735.79	Dy I	1100	2742.56	Zr II	390	2750.73	Cr II
80	2729.62	W II	350 h	2735.83	Br III	240	2743.07	Mo I	100	2750.89	Ce II
140	2729.68	Mo II	28	2735.834	Th II	200	2743.20	Fe II	20	2751.13	Fe II
400	2729.78	Ge II	30	2736.09	Ge IV	70	2743.28	Eu I	500	2751.23	Cl IV
130	2729.92	Pt I	150	2736.23	Tc I	4	2743.55	K II	450	2751.24	Gd III
2000	2730.04	Ce III	130	2736.24	Tb II	150	2743.565	Fe I	20	2751.33	Cu III
25	2730.07	Cs II	310	2736.25	Ta II	210	2743.59	Ta I	85	2751.45	Yb II
22	2730.08	Y I	170 h	2736.47	Cr I	250	2743.64	Cr II	320	2751.47	Mo I
500	2730.12	I II	12	2736.53	Mg I	200	2743.64	Hf I	45	2751.60	Cr I
80	2730.20	Mo II	40	2736.76	Rh I	3000	2743.71	Ce III	360	2751.81	Hf II
3	2730.47	Li II	60 c	2736.83	Tc II	10	2743.94	Eu III	280	2751.87	Cr II
140 d	2730.50	Bi I	10000	2736.89	Cm II	140	2744.00	Ir I	20	2752.15	Fe II
500	2730.53	Tc I	160	2736.96	Mo II	200	2744.068	Fe I	410	2752.166	Th II
3	2730.55	Kr IV	1	2736.96	K III	200	2744.08	Tm II	90	2752.17	Eu II
1	2730.55	Li II	110	2737.09	Nb II	120	2744.26	Eu II	6	2752.20	Er III
580	2730.61	Os I	500	2737.310	Fe I	130	2744.45	Ru I	660	2752.21	Zr II
40	2730.73	Fe II	120	2737.342	Cu II	80	2744.527	Fe I	75	2752.45	Ru II
120	2730.85	Hf I	120	2737.83	Fe I	25	2744.66	Pr II	500	2752.46	Tm III
220	2731.1	S III	80 h	2737.88	Mo II	800	2744.74	Tm III	410	2752.49	Ta II
21	2731.13	Ti I	25	2737.90	Pr II	190	2745.10	Co I	10	2752.68	Eu III
180	2731.35	V I	100	2737.97	Tc I	270	2745.271	Cu II	75	2752.77	Ru II
40	2731.36	Os II	400	2737.98	Tm III	40	2745.61	Eu I	80	2752.78	Hg I
50	2731.37	Eu I	30	2738.05	Be I	30	2745.78	Ba III	80	2752.783	Hg I
1000	2731.38	Tm III	75 c	2738.17	Lu II	660	2745.86	Zr II	110 h	2752.88	Cr I
200	2731.56	Re II	70	2738.48	Pt I	400	2745.99	Tm III	190	2753.01	Nb I
40	2731.58	Ti I	100	2738.53	Er III	80	2746.03	Er III	400	2753.20	Tm III
12	2731.78	Pr II	50	2738.60	Mo II	35	2746.21	Cr II	100	2753.22	Co II
280 h	2731.91	Cr I	710	2738.76	Hf II	20	2746.28	Pr II	80	2753.29	Fe II
8	2731.99	Mg I	20 c	2738.83	Tc II	290	2746.30	Mo II	140	2753.40	V II
300	2732.11	Tm III	30	2738.86	Mn I	300	2746.48	Fe II	200 c	2753.47	Pr IV
220	2732.21	Re I	170	2739.22	Ru I	250	2746.49	C II	500	2753.60	Hf III
50	2732.42	Sm	210	2739.26	Ta II	350 h	2746.52	Br II	110 h	2753.64	Re II
40	2732.61	Eu I	500	2739.27	Er III	510	2746.68	Ta I	50	2753.69	Fe I
490	2732.72	Zr II	40	2739.30	Dy II	200	2746.91	Nb I	80	2753.86	Pt I
110	2732.74	Yb II	500	2739.309	P IV	520	2747.156	Th II	700	2753.88	In I
580	2732.80	Os I	10000	2739.31	Cf	70	2747.29	Eu II	150	2754.032	Fe I
250	2732.808	Th II	270	2739.31	Er II	110	2747.46	O II	470	2754.16	U II
300	2732.87	Tc I	70	2739.38	Cr I	55	2747.58	Yb II	3600	2754.17	Lu II
330	2732.88	Mo II	400	2739.55	Fe II	70	2747.61	Pt I	35	2754.28	Cr II
610	2733.04	Re II	100	2739.71	V II	80	2747.83	Eu I	100	2754.426	Fe I
25	2733.12	Pr II	85	2739.81	Ti I	35	2747.97	Ru II	650	2754.588	Ge I
310	2733.26	Nb II	35	2739.87	Sm	10000 s	2748.02	Bk II	4000	2754.87	Ce III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
30	2754.89	Fe II	150	2761.81	Fe II	310	2767.74	Re I	980	2773.36	Hf II
22	2754.90	Cr I	150	2761.92	Er III	85	2767.85	Sm II	210	2773.70	W I
200	2754.92	Pt I	600	2761.92	Po I	4400 d	2767.87	Tl I	160	2773.78	Mo II
230	2755.01	Er II	80	2761.97	Cs II	240	2768.13	Nb II	220	2773.8	Se III
20	2755.12	Eu III	150	2762.026	Fe I	4000	2768.28	Ce III	70	2773.951	Th II
22	2755.27	Cr I	100	2762.13	Tc I	7	2768.34	Mg I	20	2774.00	Pt I
130	2755.55	F III	7	2762.23	Ar III	20 c	2768.38	Eu III	810	2774.00	W I
610	2755.63	Er II	29	2762.28	Sm	40	2768.51	Gd II	180	2774.02	Hf II
800	2755.73	Fe II	200	2762.34	Tc I	10 c	2768.54	Eu III	170 d	2774.04	Zr I
220	2755.75	Dy II	400	2762.34	W I	100	2768.72	Er III	50	2774.066	Th II
100	2755.76	Tc I	750	2762.59	Cr II	200 d	2768.73	Zr II		2774.16	Zr II
200	2755.94	Yb III	60	2762.66	Er III	270	2768.841	Th II	190	2774.39	Mo II
50	2756.06	Mo III	285	2762.77	Al III	220	2768.85	Re I	810	2774.48	W I
110	2756.07	Mo II	120	2762.772	Fe I		2768.85	Zr II	10000	2774.52	Cf
400	2756.15	Tm III	340	2762.85	U II	90	2768.93	Ru II	20	2774.69	Fe II
80	2756.20	Er III	220	2762.87	Al III	210	2768.98	W I	6	2774.70	Kr IV
250	2756.328	Fe I	80	2762.92	Ne II	6	2769.22	Hg III	50	2774.77	Pt II
200	2756.45	Zn I	22	2763.06	Cr I	50	2769.30	Fe I	60	2774.77	Sm
200 s	2756.55	Am II	1900	2763.09	Pd I	220	2769.32	Re I	60	2774.80	Er III
22	2756.75	Cr I	120	2763.109	Fe I	25	2769.35	Fe II	50	2774.958	Cd I
200	2756.76	Yb III	470	2763.27	Os I	270	2769.53	Tb II	100	2774.97	Co II
285	2756.9	S III	260	2763.42	Ru I	50	2769.60	Pr II	110	2775.2	S III
55	2757.08	Dy II	220	2763.62	Mo II	6	2769.65	Te I	25	2775.23	Zr III
150	2757.10	Cr I	20	2763.66	Fe II	800	2769.669	Cu II	40	2775.37	In I
100	2757.316	Fe I	210	2763.79	Re I	10	2769.71	Eu III	1700	2775.40	Mo II
65	2757.40	Ti I	2	2763.80	He I	400	2769.74	W I	20	2775.55	Er III
350	2757.72	Cr II	100 h	2763.894	Cd I	240	2769.76	Mo II	250	2775.55	Ir I
10	2757.75	Eu III	460	2764.08	Gd II	320	2769.81	Gd II	15	2775.82	V V
60	2757.81	Cs II	35	2764.18	Sm	30	2769.84	Pt I	770	2775.88	Ta I
14	2757.92	Ar IV	190	2764.19	Co I	270	2769.89	Ho II	50 d	2775.94	Pr II
220	2758.00	Re I		2764.2	Be II	250 h	2769.92	Cr I		2776.03	Pr II
95	2758.08	Ti I	50 h	2764.230	Cd I	700	2769.92	Tm III	85	2776.11	Sm
1000	2758.31	Ta I	400	2764.27	W II	400 r	2769.95	Sb I	30 h	2776.23	Mn I
280	2758.61	Nb I	80 h	2764.35	Cr I	510	2770.02	Er II	10	2776.26	Ar IV
65 d	2758.63	Mo II	35	2764.41	Yb II	390	2770.04	U II	170	2776.28	Yb II
530	2758.81	Zr II	75	2764.98	Nd I	230	2770.17	Gd II	160	2776.50	W II
60	2758.98	Cr II	340	2765.04	Os I	350	2770.42	Re I	38	2776.69	Mg I
21	2759.00	Yb II	100	2765.123	Th II	300	2770.50	Br III	150 h	2776.85	Pd II
10000 s	2759.10	Cf	25	2765.13	Fe II	50	2770.59	Ge II	15	2776.91	Fe II
400	2759.23	Er III	20	2765.15	I II	400	2770.64	Cl IV	300	2776.91	Os I
110 c	2759.35	Ho II	5	2765.22	Mg I	960	2770.71	Os I	250	2776.99	Cs II
80	2759.39	Cr II	35	2765.44	Ru II	200	2770.816	Th II	140	2777.10	Ho II
160	2759.47	Tb II	100	2765.50	Yb III	300	2770.86	Zn I	20	2777.31	Tc II
160	2759.63	F III	140	2765.67	V II	810	2770.88	W I	100	2777.43	Tm III
20	2759.71	Hg I	750 h	2765.74	Lu I	21	2770.98	Gd II	140	2777.73	V II
20	2759.710	Hg I	60	2765.95	Tc I	300	2770.98	Zn I	130	2777.74	Mo I
45	2759.73	Cr II	800	2765.98	Tm III	14	2771.28	Ca III	65	2777.86	Mo II
50	2759.81	Fe I	25	2766.10	Cs II	85	2771.32	Yb II	45	2778.06	Cr II
140	2760.10	Y I	10 c	2766.26	Eu III	18	2771.36	Ba II	50	2778.06	Rh I
10 h	2760.18	Ac II	110	2766.26	Mo I	30	2771.44	Mn I	60	2778.07	Fe I
20 c	2760.21	Eu III	2500 r	2766.37	Cu I	18	2771.45	Cr I	600	2778.220	Fe I
60	2760.35	Pr II	200	2766.39	Re I	100	2771.51	Rh I	32	2778.27	Mg I
130	2760.391	Th II	70	2766.50	Dy II	500	2771.67	Pt I	100	2778.38	Ru II
20	2760.53	Mo II	750	2766.54	Cr II	100	2772.	Bi IV	40	2778.69	W II
40 d	2760.74	W II	100	2766.70	Co II	60	2772.07	Er III	70	2778.706	Th II
65	2760.78	Yb II	110	2766.85	Ho II	300	2772.07	Fe I	45	2778.76	Gd I
45 h	2760.93	Mn I	500	2766.89	Tc I	75	2772.35	Ge II	40	2778.80	Pr II
15	2761.29	Ti II	80	2766.910	Fe I	70	2772.42	Dy II	150	2778.91	Tc I
65	2761.37	Yb II	160	2766.96	Hf I	330	2772.46	Ir I	230	2778.97	Er II
150	2761.42	Ce II	20	2766.99	Cd III	2000	2772.55	Lu III	22	2779.14	Cr I
690	2761.42	Os I		2766.99	Li II	110	2772.61	Dy II	45	2779.14	Gd II
190	2761.53	Mo I	100	2767.	Bi IV	200	2772.64	Tm III	85	2779.23	Sm II
80	2761.59	W II	15	2767.11	Er III	110	2772.83	Ho II	40	2779.30	Fe II
450	2761.63	Hf I	285	2767.2	Se III	170	2773.02	Hf I	390	2779.37	Hf I
430	2761.68	Ta II	250	2767.522	Fe I	8	2773.04	Sc IV	75	2779.54	Rh I
10	2761.72	Eu III	22	2767.54	Cr I	310	2773.20	Nb I	270	2779.55	Tm II
90 h	2761.76	Cr I	75	2767.54	Ag II	50	2773.23	Fe I	40	2779.58	Dy II
20	2761.78	Sn I	200 c	2767.60	Pr IV	40	2773.24	Pt I	150	2779.81	Sn I
120	2761.780	Fe I	50	2767.73	Rh I	8	2773.31	Fe III	90	2779.83	Mg I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
30	2780.00	Mn I	60	2787.96	Sn I	10	2795.21	Ra II	50	2802.05	Pr II
880	2780.04	Mo II	18	2787.96	Yb II	18	2795.29	Yb II	380	2802.07	Ta I
5	2780.11	Y III	210	2787.98	W I	1000	2795.53	Mg II	250	2802.50	Ti I
15	2780.15	Ga II	3000	2788.10	Fe I	600	2795.60	Yb III	230	2802.53	Er II
170 r	2780.22	As I	120	2788.15	F III	80	2795.65	Tc I	870	2802.56	U II
270	2780.24	Nb II	130	2788.24	Cs II	200	2795.78	Tc II	600	2802.70	Mg II
80	2780.30	Cr II	300	2788.24	Yb III	680	2796.34	Ta I	250	2802.75	Tb II
20 c	2780.48	Eu III	10	2788.37	Lu III	2700	2796.63	Lu II	140	2802.81	Ru I
360	2780.52	Bi I	30	2788.61	Ge IV	75	2796.63	Rh I	1000	2802.81	Tc I
2	2780.60	Er III	40	2788.89	Tc I	130 h	2796.70	Sm	1900	2802.84	Eu II
610	2780.70	Cr I	14	2788.96	Ar IV	530	2796.73	Os I	150	2803.02	Tc I
100	2780.82	Au I	30	2789.05	Pr II	160	2796.90	Zr II	140	2803.24	Pt I
1000	2781.01	O V	55	2789.20	Mn I	930	2796.93	Gd II	20	2803.27	Y III
400	2781.12	Tm III	500	2789.25	Tc I	7	2797.11	Ar IV	120	2803.28	Re II
20	2781.16	Lu III	150	2789.38	Sm II	730	2797.27	Tm II	400	2803.32	Yb III
25	2781.22	Tc I	100	2789.50	Hf II	540	2797.35	Ir I	15	2803.42	Bi II
520	2781.29	Ir I	140	2789.73	Hf II	70	2797.4	S III	1000	2803.43	Yb III
8	2781.29	Mg I	130	2789.80	Cs II	20	2797.59	Ac II	40	2803.46	Hg I
440	2781.40	Gd II	775	2789.85	O V	1600	2797.70	Ir I	120	2803.47	V II
10000	2781.40	Pu II	200	2790.14	Zr I	70	2797.737	Th II	40	2803.471	Hg I
32	2781.42	Mg I	20	2790.27	Sb III	680	2797.76	Ta II	11	2803.70	Bi II
10 h	2781.56	Ac II		2790.31	Li II	200	2797.78	Fe I	320	2804.07	Os I
480	2781.89	Eu II	60	2790.36	Mn I	35	2797.80	Yb II	10	2804.10	Er III
1000	2782.05	Tc I	100	2790.53	Ce II	240 d	2797.93	Mo I	70	2804.10	Mn I
130	2782.36	Nb I	13	2790.79	Mg II	16	2798.06	Mg II	300	2804.16	Br III
700	2782.47	Cl IV	5 h	2790.83	Ac IV	380	2798.18	Ir I	310	2804.35	Er II
740	2782.55	Os I	100	2791.00	Co II	100	2798.21	Yb II	30	2804.43	Hg I
36	2782.97	Mg I	60	2791.08	Mn I	5100	2798.27	Mn I	30	2804.438	Hg I
130	2783.03	Rh I	25	2791.16	Rh I	150	2798.65	Ni I	400	2804.521	Fe I
80	2783.11	Er III	12	2791.20	Y I	55	2798.67	Cr II	12	2805.3	Bi II
50	2783.31	Pr II	220	2791.29	Re I	60	2798.76	In II	2	2805.34	Hg I
550	2783.57	Re I	140	2791.42	Ce II	500	2798.86	Rb III	30	2805.59	Cd III
50	2783.69	Fe II	55	2791.44	Dy II	80	2799.03	W II	55	2805.70	Ti I
40	2783.88	Os II	70	2791.44	Y III	55	2799.114	Th II	100	2805.87	Er III
120	2784.27	Ce II	35	2791.496	Th I	110	2799.15	Zr II	130	2805.92	W II
410	2784.45	U II	40	2791.54	Mo II	110	2799.22	N II	10000	2806.11	Pu II
12	2784.47	Ar IV	15	2791.59	Ca III	30	2799.29	Fe II	60	2806.14	Mn I
10000	2784.48	Pu II	200	2791.795	Cu II	45	2799.38	Yb II	430	2806.30	Ta I
130	2784.49	Tb II	390	2791.96	Gd II	130	2799.41	Cs II	30	2806.50	Ti II
100	2784.66	Yb II	340	2791.96	W I	170	2799.528	Cu II	510	2806.58	Ta I
10000	2784.83	Cm II	90	2792.02	Ne II	220	2799.84	Mn I	100	2806.72	Ho II
400	2784.99	Mo II	120	2792.04	Zr I	400	2799.93	W I	35	2806.74	Ru II
80	2785.03	Sn I	90	2792.16	Cr II	40 h	2799.98	Pt II	20	2806.76	Ac II
350	2785.07	Tm II	20	2792.51	Eu III	100	2799.99	Ho II	2	2806.77	Hg I
30	2785.19	Fe II	35	2792.51	Pr II	50	2800.00	Yb II	2000	2806.77	Tm III
30	2785.21	Y II	500	2792.54	Er III	35	2800.06	Yb II	2800	2806.91	Os I
330	2785.22	Ir I	810	2792.70	W I	30	2800.11	Y II	1500	2806.98	Fe I
15	2785.28	Ba I	110	2793.05	Nb II	400	2800.26	Po I	100	2807.00	Y III
300 h	2785.28	Br III	50	2793.27	Pt I	150	2800.27	Rb III	630	2807.05	U II
100	2785.35	Ce II	45	2793.28	Yb II	120	2800.33	Dy II	10	2807.22	Yb III
160	2785.5	S III	25	2793.32	Cs II	180	2800.51	Tb II	85	2807.36	Sm
500	2785.59	Tc I	100	2793.73	Co II	110	2800.53	Dy II	300 h	2807.55	Br II
12	2785.59	Y II	20	2793.89	Fe II	50 h	2800.64	Pd II	500	2807.58	Rb III
70	2785.70	Cr II	50 h	2793.90	Ac IV	70	2800.77	Cr II	50 h	2807.59	Pd II
60	2785.79	Nd I	70	2793.925	Ge I	410	2800.82	Ir I	100	2807.74	Mo III
5	2785.87	Sb III	830	2793.94	U II	400	2800.87	Zn I	400	2807.76	Mo II
100	2786.	Bi IV	230	2793.99	Os I	500	2800.90	Lu III	110	2807.827	Th II
50	2786.00	Sr III	230	2794.19	Os I	30	2800.93	Au I	230	2808.00	Hf II
640	2786.31	Os I	100	2794.21	Pt II		2801.	Li I	55	2808.02	Mn I
85	2786.64	Sm	80	2794.22	Ne II	160 d	2801.05	W II	40	2808.05	Pm II
920	2786.99	O V	90	2794.255	Th II	3700	2801.06	Mn I	10	2808.09	Eu III
35	2787.63	Cr II	140	2794.41	Ho II	100	2801.06	Zn I	500	2808.36	Tc I
70	2787.68	Gd I	25	2794.44	Yb II		2801.17	W I	60	2808.38	Gd II
390	2787.69	Ta I	130	2794.50	Cs II	5	2801.17	Zn I	420	2808.39	La II
50 w	2787.72	Pm II	100	2794.53	Tc I	110	2801.41	Dy II	6	2808.44	Er III
180	2787.83	Mo I	680	2794.60	Tm II	220	2801.47	Mo I	10	2808.51	Pt I
110	2787.83	Ru II	100	2794.66	Gd II	100	2801.96	Zn II	50	2808.51	Yb III
35	2787.84	Cr I	6200	2794.82	Mn I	25000 r	2801.995	Pb I	200	2808.59	I II
100 h	2787.92	Pd II	21	2795.07	Yb II	1000	2802.04	Au II	650	2808.71	Na II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
470	2808.94	Os I	10000	2815.77	Pu II	35	2822.15	Sc II	3	2829.60	Kr IV
440	2808.98	U II	300	2815.78	Os I	30 h	2822.27	Pt II	260	2829.82	W I
180	2808.998	Th II	40	2815.91	Xe III	180	2822.37	Cr II	600	2829.87	Na II
110	2809.11	Mn I	100 s	2815.98	Am II	100	2822.55	Au II	10	2830.25	Ar IV
40	2809.17	Ti I	45	2816.071	Th II	55	2822.55	Mn I	1400	2830.30	Pt I
250	2809.30	Tb II	1700	2816.15	Mo II	45	2822.56	Y I	150	2830.34	Er III
16	2809.44	Ar IV	550	2816.18	Eu II	160	2822.57	W II	300	2830.359	As II
100	2809.48	Ne II	650	2816.19	Al II	100	2822.58	Pb I	70	2830.442	Th II
150	2809.50	Sm	28	2816.32	Yb II	490	2822.68	Hf II	180	2830.47	Cr II
850	2809.52	Na II	30	2816.33	Mn II	3000	2822.79	Pa II	15	2830.53	Sr IV
140 c	2809.62	Bi I	300	2816.39	Dy II	30	2823.13	Au II	80	2830.79	Mn I
50 c	2809.65	Tc II	600	2816.92	Yb III	20	2823.17	Pr II	270	2830.90	Ce II
750	2809.72	Gd II	500	2816.94	Cs II	680	2823.18	Ir I	220	2830.94	Sm
3	2809.76	Mg I	90000	2817.04	Y III	14000 r	2823.189	Pb I	190	2830.99	Yb II
160 c	2809.99	Ho II	260	2817.10	Ta II	30	2823.19	Cd II	300	2831.164	As II
350	2810.03	Ru I	9	2817.11	Si III	300	2823.276	Fe I	60	2831.18	Tc II
75	2810.30	Ti II	85	2817.20	Sm II	110	2823.64	N II	100 l	2831.24	Am II
1700	2810.55	Ru I	30	2817.40	Ti I	250	2824.11	Po I	1600	2831.38	W I
14	2810.72	Yb II	220	2817.44	Mo II	20	2824.14	Pr II	40	2831.44	Mo II
100	2810.804	Cu II	10	2817.58	Eu III	10000	2824.20	Cm II	7	2831.49	Si III
120	2810.86	Sm II	230	2817.68	Hf I	300	2824.20	Ho II	200	2831.55	Tm II
180	2810.91	Zr II	65	2817.84	Ti I	1250 r	2824.37	Cu I	25	2831.56	Fe II
160	2810.93	Gd II		2817.87	Ti II	390	2824.37	U II	270 c	2831.69	Ho II
2	2811.11	Mg I	630	2817.96	U II	100 h	2824.39	Ag I	10	2831.75	Sc III
220	2811.36	Ho II	85	2817.97	Mn I	1200	2824.45	Ir I	1000	2831.843	Ge II
160	2811.45	F III	810	2818.06	W I	70	2824.57	B IV	1	2831.95	Er III
500	2811.61	Tc II	10	2818.2	He I	50	2824.75	Er III	920	2832.06	U II
10000	2811.62	Cm II	50	2818.25	Pt I	100	2824.97	Yb II	30	2832.07	Mo II
20	2811.75	Co III	350	2818.29	Na II	22	2825.37	Y II	3000 l	2832.14	Pa
220	2811.75	Eu II	60	2818.36	Cr II	140	2825.42	Dy II	130	2832.16	Ti II
1	2811.78	Mg I	350	2818.36	Ru I	100 h	2825.44	Au II	18	2832.20	Yb II
180	2812.00	Ho II	3	2818.45	I IV	2	2825.52	Sn II	5000 s	2832.26	Am II
80	2812.01	Cr II	250	2818.47	Tm II	600	2825.56	Fe I	800	2832.315	Th II
100 l	2812.10	Am II	2	2818.48	I III	530	2825.56	Zr II	1500	2832.436	Fe I
500	2812.15	Rb II	1000	2818.72	Yb III	50	2825.687	Fe I	100	2833.00	Kr II
40	2812.25	W II	390	2818.74	Zr II	285	2825.85	B IV	8	2833.03	Er III
28	2812.58	Mo II	40	2818.77	Mn I	15	2826.01	Yb III	30	2833.03	Au II
60	2812.59	Sn I	18	2818.86	Y I	50	2826.13	F IV	35000 r	2833.053	Pb I
180	2812.64	Tb II	140	2818.94	Hf I	280	2826.16	Tl I	110	2833.24	Ir II
60	2812.84	Mn I	90 d	2818.97	In II	45	2826.38	Y II	140	2833.26	Eu II
200 s	2812.92	Am II	100	2819.322	Th II	150	2826.43	Rh I	180	2833.28	Hf I
100	2812.94	Cu III	40	2819.46	Tc I	240	2826.54	Mo I	100	2833.31	Ce II
30	2812.98	Ti I	30	2819.54	Sc II	140	2826.64	Ho II	8	2833.47	Ac II
30	2813.08	Eu II	200	2819.74	Hf I	180	2826.68	Rh I	10000	2833.58	Cm II
10 p	2813.24	Fe III	75	2819.78	Re II	60	2826.68	Sc II	810	2833.63	W I
2500	2813.287	Fe I	300	2819.79	Au II	22	2826.75	Cr I	300	2833.75	Gd II
70	2813.47	Mn I	880	2819.95	Re I	170	2826.855	Th II	1800	2833.83	Gd III
80	2813.58	Sn I	100 h	2820.10	Pm II	250	2827.02	Tm II	270 d	2833.91	Er II
26	2813.64	Y I	410	2820.19	Er II	190	2827.08	Nb II	110	2833.91	Zr II
30	2813.76	Ra II	1200	2820.22	Hf II	30	2827.31	Rh I	100 l	2833.95	Am II
420	2813.84	Os I	25	2820.27	Cs II	30	2827.45	Xe III	140	2833.99	F III
230	2813.86	Hf II	100	2820.336	Th II	10000 s	2827.57	Bk II	130	2834.00	Ru I
16	2813.88	Ca III	40	2820.74	F IV	80	2827.74	Mo II	310	2834.08	Re I
3400	2813.94	Eu II	2000	2820.78	Eu II	200	2827.87	Ru I	75	2834.12	Rh I
45	2814.01	Gd II	700	2820.87	Br IV	580	2827.92	Tm II	110	2834.13	Hf I
740	2814.20	Os I	29	2820.96	Sm II	200	2828.04	Tc I	70	2834.26	Cr II
70	2814.319	Th II	300	2821.12	Tm III	65	2828.07	Ti I	50	2834.28	Ge II
30	2814.45	Xe III	870	2821.12	U II		2828.15	Ti II	270 c	2834.35	Lu II
170	2814.48	Hf II	140	2821.15	Yb II	20	2828.29	Pr II	80	2834.39	Mo II
65	2814.53	Yb II	35	2821.23	Lu II	400cw	2828.72	Eu II	70	2834.71	Pt I
24	2814.67	Mo II	250	2821.29	Ni I	120	2828.808	Fe I	28	2834.97	Yb II
220	2814.68	Re I	100	2821.35	Tc II	680	2828.90	U II	210	2834.99	Ho II
190	2814.74	Ho II	50	2821.42	Sr III	80	2829.008	Ge I	80	2835.33	Mo II
30	2814.86	Tc I	55	2821.45	Mn I	25	2829.04	Cs II	400	2835.4	Cl IV
620	2814.90	Zr I	450	2821.68	B IV	4	2829.08	He I	45	2835.44	Rh I
150	2814.93	Hg II	45	2822.01	Cr II	400	2829.16	Ru I	2500	2835.63	Cr II
60	2815.02	Mn II	100	2822.025	Th II	420	2829.27	Os I	80	2835.63	Co II
1000 l	2815.28	Am II	50	2822.03	Mo II	120	2829.30	Eu II	150	2835.63	F III
150	2815.56	Co I	110	2822.03	Ru I	25	2829.42	Cs II	210	2835.64	W I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
110	2835.66	Ir I	160	2842.28	Ir I	14	2848.42	Mg I	200	2855.22	V I
110	2835.85	Ho II	14	2842.59	Yb II	10 c	2848.44	Eu III	10000 s	2855.24	Cf
120	2835.950	Fe I	280	2842.65	Nb II	100	2848.44	Yb II	8	2855.29	Ar III
3	2836.08	Kr IV	320	2842.812	Th II	560	2848.52	Ta I	250	2855.41	Er II
40	2836.18	Zr III	260	2842.82	Ta I	350	2848.52	Zr I	80 h	2855.6	Bi III
150	2836.24	Nb I	7	2842.88	Ar III	270	2849.10	Ho II	880	2855.68	Cr II
160	2836.26	O IV	1000	2842.88	Br IV	60	2849.20	Tc I	70	2856.0	S III
27	2836.31	Mn I	300	2842.96	Yb III	270	2849.21	Hf II	50	2856.00	Mo II
820	2836.40	Ir I	20	2842.98	Pr I	45	2849.29	Cr I	650	2856.03	W I
45	2836.48	Cr II	220	2843.00	Re I	21	2849.34	Yb II	50	2856.16	Rh I
35	2836.69	Gd II	1700	2843.25	Cr II	160	2849.38	Mo I	26	2856.30	Y II
75	2836.69	Rh I	130	2843.52	Zr II	3000	2849.40	Ce III	25	2856.46	Cd II
1000	2836.71	C II	200	2843.631	Fe I	360	2849.48	U II	650	2856.51	Na II
200	2836.900	Cd I	24	2843.73	Mo II	200	2849.52	Tm III	60	2856.52	Gd II
180 c	2836.92	In I	80	2843.96	Eu II	6	2849.63	Er III	100	2856.74	Au II
70	2837.00	Gd II	1000	2843.977	Fe I	3800	2849.72	Ir I	90	2856.77	Cr II
360	2837.19	U II	20	2844.01	Pr II	10	2849.80	Tl II	30	2856.91	Fe II
710	2837.23	Zr I	110	2844.18	Ho II	1200	2849.84	Cr II	50	2856.939	Hg I
1200	2837.295	Th II	640	2844.25	Ta I	20	2850.39	Eu III	50	2856.94	Hg I
160	2837.33	Ir I	220	2844.39	Mo I	1500	2850.49	Ta I	500 h	2857.13	Tc I
350	2837.368	Cu II	2300	2844.40	Os I	20	2850.62	Pr I	70	2857.40	Cr II
230	2837.42	Os I	290	2844.46	Ta II	200	2850.62	Sn I	200 c	2857.46	Pm II
200	2837.55	Re I	660	2844.58	Zr II	1500	2850.76	Os I	110	2857.68	Tb II
800	2837.60	C II	310	2844.67	Tm II	270	2850.96	Hf I	100	2857.748	Cu II
300	2837.85	Au II	100	2844.68	Ho II	150	2850.96	Tc I	11	2857.87	Y II
90	2837.96	Al I	3	2844.76	Hg III	270	2850.98	Re I	30 c	2858.14	In I
200	2838.119	Fe I	20	2844.99	Eu III	1900	2850.98	Ta I	100	2858.29	Te II
470	2838.17	Os I	60	2845.04	Tc I	12	2851.09	Sb II	45	2858.33	Yb II
350	2838.51	Rb II	330 h	2845.13	Lu I	110	2851.10	Ti II	25	2858.34	Fe II
5100	2838.63	Os I	8	2845.29	Er III	100	2851.11	Sb I	220	2858.44	Ta II
390	2838.71	Er II	290 c	2845.35	Ta I	360	2851.13	Yb II	45	2858.46	Yb II
55	2838.79	Cr II	100	2845.44	Rb III	30	2851.16	Kr III	610	2858.91	Cr II
1100	2839.16	Ir I	1000	2845.527	Ge II	180	2851.21	Hf II	2000 c	2859.11	Tc I
120	2839.34	Zr II	100	2845.594	Fe I	270	2851.260	Th II	60 l	2859.16	N V
2	2839.44	I III	410	2845.83	Hf I	60	2851.35	Sm	3	2859.3	Kr IV
30	2839.51	Fe II		2846.	Li I	120	2851.36	Cr II	100	2859.39	Yb II
20 c	2839.56	Eu III	22	2846.02	Cr I	110	2851.45	Nb I	800	2859.49	Na II
800	2839.56	Na II	60	2846.08	Er III	16	2851.65	Mg I	260	2859.67	Eu II
5	2839.62	Si III	10	2846.15	Te II	16	2851.66	Mg I	19	2859.78	Gd II
75	2839.68	Ge II	130	2846.19	Cs II	800	2851.797	Fe I	430	2859.80	Yb II
20	2839.80	Fe II	160	2846.28	Nb II	55	2851.86	Yb II	310	2859.84	Er II
460	2839.89	U II	420	2846.39	Os I	350	2851.97	Zr II	180	2859.97	V I
1400 r	2839.99	Sn I	10	2846.39	Tc II	10000 l	2852.03	Cf	180	2860.02	Ru I
110	2840.02	Cr II	1	2846.42	Sn II	60	2852.05	Eu II	200	2860.12	Tm II
90	2840.10	Al I	120	2846.57	V I	6000	2852.13	Mg I	150	2860.33	F III
820	2840.22	Ir I	12	2846.72	Mg I	190	2852.14	Tb II	55	2860.39	Yb II
560	2840.23	Gd II	12	2846.75	Mg I	80	2852.42	Cs II	100 r	2860.44	As I
60	2840.30	Sm	100	2846.92	Au II	16	2852.81	Na I	390	2860.47	U II
200	2840.35	Re I	150 h	2847.16	Ac II	140	2852.87	V I	30	2860.490	Th I
50	2840.38	Tc II	230 h	2847.18	Yb II	5	2853.0	Kr IV	180	2860.56	Hf I
150	2840.54	Ru I	80	2847.35	Co II	15	2853.01	Na I	80 h	2860.68	Pt II
6	2840.557	Pb II	30 h	2847.4	Bi III	16	2853.11	Pt I	50 d	2860.68	Rh I
15	2840.65	Fe II	60	2847.49	Sm II	55	2853.22	Cr II		2860.76	Rh I
100 w	2840.82	Pm II	3000	2847.51	Lu II	370	2853.23	Mo II	440	2860.93	Cr II
110	2840.94	Nb I	110	2847.57	V II	21	2853.41	Yb II	1500	2860.96	Os I
30	2841.00	Kr III	40	2847.65	Xe III	18	2853.68	Yb II	20	2861.00	Te II
250	2841.15	Nb II	750	2847.675	Hg II	40	2853.91	Gd II	760	2861.01	Hf II
10	2841.17	Te II	750	2847.68	Hg II	40	2853.93	Ti II	350	2861.02	Na II
140	2841.33	Gd II	40	2847.7	S II	75	2853.97	Ge II	240	2861.09	Nb II
400	2841.57	W I	810	2848.02	W I	25	2853.99	Pr II	140	2861.21	Yb II
740	2841.60	Os I	100	2848.084	Th I	640	2854.07	Ru I	100	2861.23	Ho II
35	2841.68	Ru II	15	2848.11	Fe II	55	2854.14	Yb II	100	2861.34	Yb II
1000	2841.72	Na II	210	2848.19	Zr II	200	2854.17	Tm I	2000	2861.39	Ce III
150 w	2841.86	Pm II	1700	2848.23	Mo II	140	2854.34	V II	420	2861.41	Ru I
20 l	2841.94	Pr III	420	2848.25	Os I	50	2854.342	Th I	220	2861.42	Th II
190	2841.94	Ti II	50000 w	2848.30	La IV	70	2854.43	Y II	250	2861.49	Ho II
100	2842.	Bi IV	15	2848.32	Fe II	45	2854.49	Yb II	760	2861.70	Hf II
360	2842.09	U II	14	2848.34	Mg I	200	2854.59	Pd II	200	2861.74	Tm II
160	2842.15	Mo II	270	2848.37	Er II	55	2855.07	Cr II	100 l	2861.92	Am II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
360	2861.98	Ta I	310	2868.65	Ta I	270	2876.95	Nb II	300	2884.406	As II
95	2862.32	Ti II	55	2868.74	Ti II	530	2877.03	Nb II	10000 l	2884.77	Bk II
30	2862.40	Xe III	40	2868.82	Te II	600	2877.100	Cu II	380	2884.78	V II
120	2862.48	Gd II	140	2869.13	V II	180	2877.44	Ti II	30	2884.89	Pr II
790	2862.57	Cr II	1600	2869.23	Tm II	100 h	2877.52	Pt II	360	2885.049	Th II
280	2862.57	Eu II	50	2869.307	Fe I	270	2877.68	Ir I	130	2885.14	La II
5	2862.60	Ti IV	1	2869.52	Er III	110	2877.69	V II	570 h	2885.14	Lu I
140	2862.70	Dy I	150	2869.77	Rb III	190	2877.88	Dy II	4	2885.15	I III
150	2862.72	Ho II	340	2869.81	Zr II	1000 r	2877.92	Sb I	160	2885.27	N II
120	2862.86	F III	130	2869.82	Hf II	180	2877.98	Cr II	120	2885.53	Dy I
280	2862.94	Rh I	70	2869.916	Th II	100 h	2878.01	Pd II	130	2885.60	Gd II
24	2863.20	Mo II	18	2869.95	Ca III	8	2878.24	Er III	75	2885.97	Rh I
12000 c	2863.30	La IV	3000	2870.01	Pa	300	2878.40	Os I	28	2885.97	Yb II
1000 r	2863.32	Sn I	25	2870.06	Yb II	70	2878.45	Cr II	850	2886.26	Na II
35	2863.37	Os II	60	2870.08	Mn II	10000 s	2878.57	Bk II	70	2886.26	Yb II
110	2863.5	S III	550	2870.406	Th II	1500	2878.63	I II	230	2886.29	Tb II
370	2863.81	Mo II	210	2870.44	Cr II	30	2878.657	Th I	190	2886.44	Co I
110	2863.84	Ir I	210	2870.55	V I	110	2878.66	Rh I	1	2886.45	Ga II
50	2863.95	Nd	50	2870.61	Kr III	230	2878.72	W I	95	2886.48	Y I
500	2864.02	Ni II	340	2870.97	U II	100	2878.87	Eu I	740	2886.54	Ru I
4	2864.24	Pb IV	80 w	2871.10	Xe III	220	2879.05	Mo II	70	2886.68	Mn II
160	2864.31	Mo I	80	2871.22	Co II	610	2879.11	W I	3	2886.96	Au I
100	2864.32	Nb I	60 w	2871.24	Xe III	110	2879.16	V II	170	2887.00	Cr I
240	2864.36	V I	750	2871.28	Na II	120	2879.27	Cr I	210	2887.14	Hf I
65	2864.40	Rh I	50	2871.35	Rh I	35	2879.39	Os II	460	2887.25	U II
25	2864.42	Eu II	100 h	2871.37	Pd II	610	2879.40	W I	3 c	2887.30	Pb II
500	2864.49	Tc I	100	2871.40	F II	140	2879.41	Ir I	10 h	2887.51	Si II
4	2864.50	Pb IV	3000 h	2871.42	Pa II	80	2879.49	Mn II	100	2887.54	Hf I
140	2864.66	Mo I	470	2871.42	Ta I	220	2879.76	Ru I	140	2887.58	F III
4	2864.67	I III	1700	2871.51	Mo II	380	2880.02	Ta I	2900	2887.68	Re I
6	2864.68	I IV	110	2871.63	Cr I	350	2880.03	V II	1000	2887.73	Tc I
200	2864.73	Xe II	30	2871.7	Xe III	30	2880.20	Os II	360	2887.817	Th II
40 h	2865.05	Pt II	40	2871.75	Gd II	360	2880.26	Ho II	80	2887.85	Eu II
60	2865.06	Gd II	210	2871.99	Ho II	100	2880.72	Nb II	200	2888.04	Yb II
750	2865.11	Cr II	10000 l	2872.11	Bk II	75	2880.76	Rh I	130 c	2888.06	Re II
55	2865.33	Cr II	50	2872.334	Fe I	200 r	2880.767	Cd I	65	2888.15	Mo II
50	2865.50	Ni I	3	2872.36	Au I	95	2880.87	Cr II	25	2888.20	Pt I
100	2865.61	Nb II	85	2872.88	Mo II	460	2880.98	Ho II	140	2888.25	V II
40	2865.62	Mo II	30	2872.94	Mn II	30	2881.14	Cr I	410	2888.26	U II
30	2865.64	Pr II	650	2872.95	Na II	900	2881.15	Na II	10	2888.31	Co III
80	2865.68	In II	14000 r	2873.311	Pb I	250	2881.19	Cs II	10	2888.40	Au I
970	2865.68	U II	270	2873.36	Ta I	50 r	2881.224	Cd I	100	2888.46	Tc I
300	2866.01	Po I	160	2873.48	Cr II	460	2881.33	Gd II	1000 l	2888.51	Am II
650	2866.06	W I	45	2873.49	Yb I	70	2881.34	Sm	55	2888.74	Cr II
120	2866.09	Sm II	260	2873.56	Ta I	1000	2881.579	Si I	280	2888.83	Nb II
100 s	2866.20	Am II	30	2873.62	Rh I	50	2881.60	Pr I	65	2888.93	Ti II
40	2866.33	Gd II	90	2873.82	Cr II	85	2881.68	Sm	45	2889.06	Sm
80	2866.37	Cs II	750	2873.88	Rb II	19	2881.78	Ca III	75	2889.11	Rh I
2100	2866.37	Hf I	230	2874.06	Ho II	700	2882.02	Tm III	30	2889.20	Tc II
17	2866.54	Ca III	250	2874.14	Ce II	55	2882.12	Ru II	700	2889.29	Cr I
170	2866.59	V I	210	2874.17	Ta I	40	2882.13	Gd II	150	2889.45	F III
550	2866.64	Ru I	80	2874.172	Fe I	30	2882.31	Pr II	160	2889.58	Mn II
220	2866.69	Mo II	6	2874.24	Ga I	140	2882.37	Rh I	800	2889.62	Hf I
610	2866.74	Cr II	6	2874.40	Ar IV	380	2882.50	V II	1200	2889.62	U II
200	2867.06	Yb II	160	2874.43	Ho II	40	2882.511	Th II	380	2889.62	V II
90	2867.10	Cr II	30	2874.86	Sr III	820	2882.64	Ir I	10000 s	2889.80	Bk II
240	2867.19	Re I	360	2874.96	Os I	490	2882.74	U II	55	2889.82	Cr II
480	2867.65	Cr II	1800	2874.98	Ru I	40	2882.90	Mn I	75	2889.84	Rh I
6000	2867.67	Y III	200	2875.28	Re I	60	2883.09	Sm	120 d	2890.18	In II
	2868.	Li I	800	2875.39	Nb II	570	2883.18	Nb II	120	2890.74	Dy II
100	2868.09	Tc I	380	2875.60	Ir I	200	2883.44	Re I	630	2890.94	Tm II
210	2868.10	V I	40 h	2875.85	Pt II	300	2883.45	Au I	1300	2890.99	Mo II
40	2868.11	Mo II	400	2875.86	Yb III	130	2883.60	Ru I	55	2891.07	Ti II
100	2868.180	Cd I	380	2875.98	Ir I	25	2883.74	Cs II	3000 h	2891.14	Pa II
110	2868.31	Ru I	490	2875.98	Zr I	280	2884.11	Ti II	95	2891.28	Mo II
40	2868.32	Mo II	320	2875.99	Cr II	9	2884.12	Ar III	60	2891.34	Sm
70	2868.40	Sm II	60	2876.06	Eu II	270	2884.196	Cu II	3600	2891.38	Yb II
35	2868.461	Th I	230	2876.24	Cr II	110	2884.28	Dy II	55	2891.42	Cr I
500	2868.52	Nb II	150	2876.33	Hf II	320	2884.289	Th II	25	2891.612	Ar II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
900	2891.64	V II	110	2897.88	La III	160	2905.27	Mo I	670	2910.59	Nb II
770	2891.84	Ta I	10000	2897.97	Pu II	120	2905.30	F III	200	2910.594	Th II
300	2891.96	Au I	4000	2897.98	Bi I	180	2905.49	Cr I	70 s	2910.61	Pr III
40	2892.172	Th II	20	2898.13	Be I	210	2905.58	Re I	10000 l	2910.65	Bk II
100	2892.18	Kr III	10	2898.19	Be I	140	2905.65	Ru I	2	2910.77	Ga II
120	2892.26	Zr I	20	2898.25	Be I	55	2905.66	Ti I	260	2910.90	Cr I
55	2892.39	Mn II	1800	2898.26	Hf I	500	2905.69	Si II	4	2910.97	I IV
530	2892.44	V II	600	2898.30	Yb III	3	2905.74	Au I	3	2910.98	I III
200	2892.54	Eu I	90	2898.54	Cr II	8 p	2905.80	Fe III	270	2911.00	W I
180	2892.56	Ru I	50	2898.70	Mn II	30	2905.90	Au I	560	2911.06	V II
10 c	2892.60	Eu III	130	2898.71	Hf II	60	2905.90	Pt I	200 l	2911.13	Am II
900	2892.66	V II	14	2898.82	Y II	150	2906.13	V I	250	2911.14	Cr I
190	2892.81	Mo II	160	2898.86	Tb II	1000	2906.31	Yb III	80	2911.14	Ne II
140	2893.03	Eu I	1	2898.90	K III	4	2906.36	Mg I	90	2911.320	Th II
160	2893.07	La II	10000	2898.94	Pu II	190	2906.39	Dy II	9000	2911.39	Lu II
200	2893.16	Tc I	260	2899.04	Ta I	900	2906.46	V II	85	2911.52	Yb II
25	2893.22	Pt I	80	2899.21	Cr I	80	2906.59	Ne II	45	2911.68	Cr II
370	2893.25	Cr I	400	2899.24	Nb II	50	2906.6	Xe III	470	2911.74	Nb II
100	2893.25	Au II	100	2899.29	Tm III	3200	2906.68	Eu II	50 s	2911.77	Pr III
100 l	2893.29	Am II	55	2899.48	Cr II	780	2906.80	U II	40	2911.89	Xe III
1400	2893.32	V II	200 l	2899.56	Am II	80	2906.82	Ne II	1100	2911.92	Mo II
400 h	2893.40	Br II	110	2899.60	V I	21	2906.88	Yb II	90	2912.009	Th II
150	2893.45	Tc I	85	2899.70	Yb II	450	2906.93	Al III	410	2912.05	Cl II
150	2893.598	Hg I	250	2899.720	Th II	3000 h	2906.93	Pa	450	2912.08	Ti I
150	2893.60	Hg I	80	2899.75	Cs II	100	2907.04	Au II	120	2912.157	Fe I
45	2893.62	Yb II	21	2899.79	Ca III	4000	2907.05	Ce III	40	2912.23	Eu III
	2893.65	Ga II	10000	2899.90	Cm II	80	2907.12	Mo II	120	2912.26	Pt I
10000 s	2893.66	Bk II	65	2899.96	Rh I	160	2907.21	Rh I	2100	2912.33	Os I
360	2893.83	Eu I	80	2900.16	Mn II	40	2907.22	Mn I	100	2912.33	Tm III
600	2893.86	Pt I	4500	2900.30	Lu II	200	2907.24	Ir I	80 w	2912.36	Xe III
700	2893.95	Na II	70	2900.80	Mo II	35	2907.44	Gd II	75	2912.62	Rh I
320	2894.14	U II	120	2900.82	Dy II	60	2907.46	Ni I	40 c	2912.64	Eu III
190	2894.17	Cr I	170	2900.84	Ho II	490	2907.47	V II	1	2912.80	Sn II
200	2894.32	Tc I	900	2901.14	Na II	10	2907.50	Fe III	18	2912.86	Yb II
950	2894.45	Mo II	110	2901.54	Tb II	12	2907.70	Fe III	10000	2912.97	Cm II
160	2894.45	Tb II	110	2901.94	Ru I	1100 h	2907.71	Br IV	12	2913.00	Ar IV
50	2894.504	Fe I	260	2901.95	Ir I	85 d	2907.88	Sm	10	2913.04	Eu III
410	2894.51	U II	560	2902.05	Ta I		2907.99	Sm II	60	2913.08	Gd II
6300	2894.84	Lu II	100	2902.30	Zn II	470	2908.24	Nb II	1000	2913.15	Tc I
340	2894.99	Ho II	18	2902.41	Yb II	780	2908.28	U II	140	2913.29	F III
	2895.	Li I	9 p	2902.47	Fe III	28	2908.33	Yb II	6000	2913.41	Y III
8 p	2895.08	Fe III	830 c	2902.48	Re I	110	2908.42	Ce II	300	2913.52	Au II
3 h	2895.13	Si IV	2	2902.92	Mg I	50	2908.506	Th I	120	2913.54	Pt I
8	2895.20	Ac II	21	2902.92	Yb II	2400	2908.82	V II	200	2913.54	Sn I
150 h	2895.22	Xe II	300	2903.05	Lu I	370	2908.88	Ru I	60	2913.73	Cr I
250	2895.241	P III	290	2903.07	Mo II	160	2908.99	Eu I	55	2913.81	Mo II
150	2895.41	Te II	360	2903.08	V II	260	2909.05	Cr I	390	2913.95	Dy II
160	2895.62	Ho II	45	2903.167	Th II	9600	2909.06	Os I	25	2914.01	Ni I
490	2896.01	Re I	500	2903.69	Rb III	600	2909.12	Mo II	210	2914.12	Ta I
440	2896.01	W I	40	2903.81	Tc I	30	2909.17	Kr III	170	2914.21	Yb II
260	2896.06	Os I	26	2903.97	Cr II	35	2909.19	Yb II	320	2914.25	U II
360	2896.21	V II	10000	2904.25	Pu II	570 c	2909.41	Ho II	3	2914.442	Pb II
1000	2896.34	Tc I	300	2904.28	Si II	55	2909.48	Yb II	100 l	2914.49	Pr III
1500	2896.44	W I	160	2904.3	S III	210	2909.58	Er II	140 h	2914.60	Mn I
55	2896.46	Cr II	1200	2904.41	Hf I	550	2909.82	Re I	360	2914.63	U II
30	2896.62	Xe III	12	2904.43	Fe III	100 l	2909.86	Am II	80	2914.65	Cs II
210	2896.75	Cr I	1000	2904.47	Er II	140	2909.91	Hf II	200	2914.67	Cd II
30	2896.82	Ac II	2 h	2904.47	Si IV	30	2909.92	Ti II	160	2914.75	Tb II
28	2896.90	Yb II	160	2904.58	La III	710	2910.02	V II	3	2914.82	Au I
310	2896.96	Er II	110	2904.62	Dy II	90	2910.06	Ne II	380	2914.93	V I
650	2897.15	Ir I	55	2904.68	Cr I	65	2910.17	Rh II	80	2915.12	Ne II
320	2897.44	Tb II	800	2904.72	Na II	130	2910.28	Sm II	22	2915.23	Cr II
390	2897.52	Er II	9000	2904.73	Gd III	110	2910.30	Tb II	140	2915.28	Yb II
140	2897.63	Mo II	890	2904.75	Hf I	1500	2910.36	Er II	160	2915.30	Tb II
55 d	2897.67	Cr II	260	2904.80	Ir I	530	2910.39	V II	90	2915.42	Rh I
18	2897.69	Y II	25	2904.81	Rh I	10000	2910.40	Pu II	3	2915.45	Mg I
	2897.73	Cr II	1100	2904.92	Na II	90	2910.41	Ne II	3	2915.45	Mg I
470	2897.81	Nb II	10000	2904.94	Pu II	230	2910.48	W I	22	2915.46	Cr II
300	2897.87	Pt I	160	2905.23	Zr II	170	2910.53	Gd II	310	2915.49	Ta I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
190	2915.60	Tb II	3	2922.86	Ge III	120	2929.007	Fe I	55	2935.11	Yb II
270	2915.62	Er II	30	2923.02	Ac II	130	2929.11	Rh I	90	2935.14	Cr II
170	2915.82	Ho II	30	2923.10	Rh I	200	2929.27	Cd II	65	2935.20	Mo II
300	2915.99	Zr II	360	2923.10	W I	350	2929.27	Er II	110	2935.87	V I
150	2916.227	Hg II	95	2923.32	Gd II	30	2929.34	Sr III	150	2935.94	Hg II
120	2916.24	Tb II	20 c	2923.34	Tc II	26	2929.44	Cr II	26	2935.96	Ti
1100	2916.26	Ru I	1300	2923.39	Mo II	360	2929.51	Os I	630	2935.99	Tm II
150	2916.27	Hg II	1000	2923.49	Na II	490	2929.63	Hf II	100	2936.	Bi IV
160	2916.34	F III	230	2923.54	W I	10000	2929.71	Pu II	100	2936.086	Th I
440	2916.36	Ir I	710	2923.62	V I	1700	2929.79	Pt I	300	2936.22	Br III
18	2916.43	Yb II	10000	2923.81	Ce III	450	2929.90	Hf I	160	2936.31	Zr II
2000	2916.48	Hf I	8	2923.90	Fe III	6	2929.96	Ti IV	3	2936.54	Mg II
40	2916.57	Cr III	100	2924.	Bi IV	18 h	2930.03	Y II	880	2936.68	Ir I
110	2916.64	Zr II	180	2924.02	Rh I	50	2930.06	Mo II	15	2936.7	Bi II
65 h	2916.73	Re II	2400	2924.02	V II	50 s	2930.19	Pr III	10	2936.74	Mg I
400 h	2917.18	Br II	120	2924.16	Tb II	100	2930.24	Co II	10	2936.74	Mg I
530	2917.26	Os I	45	2924.24	Yb II	1100	2930.50	Mo II	1200	2936.903	Fe I
5	2917.33	I IV	35	2924.25	Gd II	270	2930.61	Re I	200 l	2936.99	Am II
3	2917.35	I III	140	2924.32	Mo II	55	2930.77	Mo II	21	2937.19	Yb II
120	2917.37	V II	19	2924.33	Ca III	710	2930.81	V II	150	2937.32	Ti I
30	2917.44	Eu II	120	2924.53	Tb II	35	2930.85	Cr II	14	2937.33	Ti IV
1100	2917.52	Na II	180	2924.62	Hf I	750	2930.88	Na II	85	2937.48	Sm II
1500	2917.74	Y III	1700	2924.64	V II	10000	2930.98	Pu II	120	2937.66	Mo I
10000	2918.00	Pu II	4400	2924.79	Ir I	20 c	2931.00	Eu III	50	2937.71	Nb III
160	2918.08	B II	850	2925.04	Eu II	15	2931.03	Ti	950	2937.74	Na II
300	2918.24	Au II	250	2925.050	Th II	500	2931.09	Cs II	710	2937.80	Hf II
270	2918.24	Zr II	230	2925.13	W I	2	2931.11	I III	3200	2938.30	Bi I
360	2918.25	W I	410	2925.19	Ta I	510	2931.28	Os I	40	2938.30	Mo II
210	2918.27	Tm II	5000	2925.26	Ce III	50	2931.281	Th I	20 h	2938.42	Ag I
2800	2918.32	Tl I	110	2925.35	Ho II	580	2931.41	U II	5	2938.45	K III
100	2918.38	Co II	60	2925.41	Hg I	110	2931.47	Nb II	250	2938.47	Ir I
1800	2918.40	Gd III	60	2925.413	Hg I	10000	2931.54	Ce III	12	2938.47	Mg I
45	2918.52	Gd II	190 h	2925.57	Mn I	200	2931.83	Sr I	12	2938.47	Mg I
1600	2918.56	Y III	300	2925.57	Os I	130	2931.94	Rh I	10000	2938.54	Pu II
230	2918.57	Ir I	80	2925.62	Ne II	80 w	2932.10	Ne II	25	2938.95	Ba III
580	2918.58	Hf I	270	2925.65	Tm II	16	2932.19	Au	10000	2938.95	Pu II
50	2918.63	W II	10000	2926.08	Pu II	10000	2932.32	Pu II	100 l	2939.08	Am II
100	2918.67	Ce II	160	2926.09	Ho II	140	2932.49	F III	190	2939.27	Ir I
10000	2918.80	Pu II	80	2926.3	As III	440	2932.61	U II	1500	2939.30	Mn II
120	2918.83	Mo II	11	2926.33	Ar IV	1100	2932.63	In I	45	2939.53	Yb II
120	2918.89	Tb II	10000 s	2926.49	Bk	26	2932.70	Cr II	150	2940.05	Tb II
1100	2919.05	Na II	680	2926.74	Tm II	310	2932.70	Ta I	470	2940.06	Ta I
160	2919.05	Y I	10 h	2926.77	Ag I	160	2932.89	Tb II	95	2940.10	Mo II
400	2919.31	Po I	400	2926.96	Br III	100	2933.	Bi IV	40	2940.2	Xe III
70	2919.34	Pt I	320	2926.99	Zr II	1100	2933.06	Mn II	45	2940.22	Cr II
280	2919.35	Yb II	60	2927.08	Cr II	10	2933.27	Co III	1200	2940.22	Ta I
320	2919.59	Hf II	320	2927.38	U II	10000	2933.30	Pu II	530 p	2940.37	U II
150	2919.61	Ru I	830 c	2927.42	Re I	1700	2933.55	Ta I	250 h	2940.39	Mn I
300	2919.62	Ho II	200 l	2927.53	Am II	180	2933.55	Ti I		2940.48	Mn I
2100	2919.79	Os I	65	2927.54	Mo II	340	2933.86	U II	45	2940.52	Yb II
6	2919.82	Sn II	35	2927.54	Ru II	80	2933.89	Tc I	15	2940.53	Y III
140	2919.840	Th II	1100	2927.81	Nb II	55	2933.97	Cr II	140	2940.54	Ir I
1200	2919.85	Na II	25	2927.85	Yb II	2	2934.02	Li II	35	2940.589	Th II
30	2919.89	Te II	50	2927.87	Cd II	27	2934.02	Mn I	80	2940.65	Ne II
210	2919.99	V II	10000 s	2927.91	Bk	2	2934.07	Li II	30	2940.67	Au I
380	2920.38	V II	80	2928.15	Cr II	850	2934.08	Na II	2000	2940.77	Hf I
1000 s	2920.59	Am II	1000	2928.20	Tc I	5	2934.12	Li II	500	2940.95	Cs II
1300	2920.95	Na II	10000	2928.25	Pu II	55	2934.135	Th II	60	2941.04	Mn I
400	2921.08	Tm III	250	2928.254	Th II	1	2934.25	Li II	110	2941.05	Dy II
55	2921.12	Yb II	95	2928.30	Cr II	800	2934.30	Mo II	100	2941.05	In II
90	2921.24	Cr II	300 c	2928.30	Ho II	110	2934.31	Dy II	110	2941.22	Mo II
50	2921.26	Nd	35	2928.34	Gd II	35	2934.36	Yb I	200	2941.33	O V
30	2921.38	Pt I	340	2928.34	Ti I	210	2934.40	V II	60	2941.343	Fe I
160	2921.45	O IV	490	2928.60	U II	250	2934.52	Dy II	900	2941.37	V II
440	2921.52	Tl I	27	2928.68	Mn I	9	2934.60	Sr IV	10000	2941.39	Pu II
440 p	2921.68	U II	2	2928.75	Mg II	160	2934.61	Zr II	450	2941.49	V II
60	2921.82	Cr II	10	2928.91	Eu III	1200	2934.64	Ir I	870	2941.54	Nb II
500	2921.91	Tc I	10000	2928.92	Cm II	260	2934.64	Os I	210	2941.65	O V
520	2922.49	Pd I	300	2928.97	Yb III	690	2935.00	W I	10000 l	2941.71	Bk II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
1300	2941.92	U II	480	2947.39	W I	10	2953.77	La III	270	2962.27	Re I
13	2942.00	Mg I	2 c	2947.43	Pb II	600	2953.940	Fe I	30	2962.48	Ba III
2	2942.00	Mg I	40	2947.5	Xe III	1100	2954.20	Hf I	65	2962.52	Yb II
1100	2942.00	Ti I	950	2947.50	Na II	100	2954.22	Au II	30000 c	2962.58	La IV
28	2942.04	Yb II	1000	2947.72	Tm III	120	2954.33	V I	320	2962.68	Zr II
220	2942.05	Ho II	35	2947.80	Gd II	90 w	2954.40	Pr III	85	2962.74	Sm II
50	2942.11	Te II	1000	2947.876	Fe I	10000	2954.46	Pu II	410	2962.77	V I
240	2942.14	Ta I	70	2948.01	Gd II	150	2954.49	Ru I	55	2962.88	Nd II
80	2942.25	Cs II	340	2948.09	U II	30	2954.58	Ti	140	2962.89	Mo I
230 d	2942.33	V I	40	2948.1	Xe III	100	2954.73	Co II	150	2962.99	Ir I
70 s	2942.43	Pr III	1100 h	2948.23	Os I	390	2954.77	U II	100 l	2963.02	Am II
450	2942.66	Na II	1300	2948.26	Ti I	45	2955.32	Yb II	8	2963.23	Fe III
30	2942.76	Pt I	250	2948.31	Dy II	30	2955.41	Rh I	150	2963.24	Ne II
200	2942.85	Os I	8	2948.39	Fe III	9500	2955.53	Gd III	21	2963.26	Yb II
340	2942.860	Th II	390	2948.40	Y I	35	2955.60	Gd II	4200	2963.32	Lu II
200	2942.893	Ar II	20 p	2948.48	Y III	150	2955.72	Ne II	1500	2963.32	Ta I
440	2943.14	Re I	2000	2948.53	Ce III	60	2955.78	Lu II	12	2963.4	Bi II
2700	2943.15	Ir I	3 c	2948.53	Pb II	320	2955.78	Zr II	18	2963.40	Ru II
230	2943.20	V I	1	2948.94	K III	95	2955.84	Mo II	45	2963.46	Yb II
70	2943.49	Sm II	320	2948.94	Zr II	35	2955.849	Th II	10000	2963.47	Pu II
6	2943.64	Ga I	150	2949.068	Th II	1	2955.93	Er III	65	2963.58	Nd II
100	2943.729	Th I	1900	2949.20	Mn II	200	2955.93	Tc I	130	2963.60	Gd II
830	2943.90	U II	370	2949.50	Ru I	120	2955.94	Ce II	28	2963.607	Th I
500	2943.91	Ni I	1400	2949.53	Os I	240	2956.06	Mo II	250	2963.79	Mo II
30	2943.97	Pr II	150	2949.62	Rb III	580	2956.06	U II	450	2964.06	Os I
6	2944.17	Ga I	230	2949.63	V I	2000	2956.07	Rb III	1500	2964.52	Er II
140	2944.21	Mo I	270 h	2949.73	Lu I	1600	2956.13	Ti I	440	2964.52	W I
12	2944.40	Fe II	200	2949.76	Ir I	250	2956.21	Tb II	220	2964.60	Dy I
2400	2944.40	W I	30	2949.80	Cs II	20	2956.74	Eu III	130	2964.76	Yb II
300	2944.49	Ho II	210 d	2949.81	Os I	170	2956.80	Ti I	70	2964.8	S III
140	2944.56	Dy II	10000	2950.06	Pu II	10	2956.90	Eu III	110	2964.80	Ce II
1100	2944.57	V II	10 c	2950.20	Eu III	70	2956.90	Mo II	90 s	2964.85	Pr III
160	2944.71	Hf I	60	2950.24	Fe I	20 c	2957.01	In I	1400	2964.88	Hf I
30	2944.75	Pt I	170	2950.33	Dy II	100 s	2957.05	Am II	50	2964.96	Mo II
150	2944.82	Mo II	28	2950.33	Yb II	12	2957.31	Ti IV	350	2964.96	Y I
10	2945.11	He I	300	2950.35	V II	250	2957.364	Fe I	460	2965.03	U II
60	2945.2	Xe III	500 l	2950.39	Am II	260	2957.52	V II	720	2965.11	Re I
10000	2945.26	Pu II	20	2950.4	Bi II	170	2957.580	Th II	770	2965.13	Ta II
270	2945.28	Er II	80	2950.438	Th II	18	2957.63	Yb II	550	2965.16	Ru I
140	2945.66	Mo I	110	2950.50	La II	130 h	2957.91	Re II	150	2965.254	Fe I
180	2945.67	Ru II	1200	2950.68	Hf I	540	2958.02	Hf I	210	2965.27	Mo II
800	2945.70	Na II	7	2950.84	La III	100 l	2958.39	Am II	80	2965.43	Gd II
110 h	2945.88	Nb II	1100	2950.88	Nb II	1	2958.63	Er III	770	2965.54	Ta I
140	2945.91	Yb II	100	2951.01	Rb III	30	2958.77	Ti	170	2965.55	Ru II
	2945.95	Mo II	1200	2951.22	Ir I	30	2958.91	Eu I	600	2965.56	Cl III
10000	2946.00	Pu II	1200	2951.24	Na II	600	2958.92	Po I	170	2965.71	Ti I
190	2946.01	Mo I	350	2951.26	Tm II	25	2959.10	Pt I	450	2965.74	Na II
99000	2946.01	Y III	210	2951.48	Zr II	5	2959.15	Si III	1500	2965.76	Re I
90	2946.04	Ne II	160	2951.6	Se IV	35	2959.47	Eu II	340	2965.86	Sc I
110	2946.12	Nb II	10000	2951.62	Pu	615	2959.572	As II	430	2965.86	Tm II
45	2946.30	Yb II	1200	2951.69	Lu II	80	2959.68	O III	45	2966.05	Cr II
140	2946.42	Mo I	10000 l	2951.76	Bk II	26	2959.71	Ti I	12	2966.10	Sb II
110	2946.53	V I	510	2951.92	Ta I	28	2959.853	Th I	100	2966.15	Tm III
230	2946.62	Er II	640	2952.08	V II	80	2959.99	Fe I	60 d	2966.17	In II
50	2946.68	Te II	110	2952.12	Dy II	35	2959.99	Ti I	15	2966.460	Pb I
140	2946.69	Mo II	210	2952.29	W II	25	2960.05	Ba III	1000 l	2966.71	Am II
18	2946.76	Yb II	1100	2952.40	Na II	850	2960.12	Na II	10000	2966.84	Pu II
60	2946.84	Cr II	35	2952.43	Gd I	260	2960.21	Eu II	500	2966.85	Tm III
110	2946.90	Nb II	2000 h	2952.55	Ac III	95	2960.24	Mo II	1500	2966.898	Fe I
230	2946.97	Ir I	50	2952.56	Kr III	60	2960.75	Pt I	620	2966.93	Hf I
180	2946.99	Ru I	200cw	2952.68	Eu II	320	2960.87	Zr I	150	2967.18	Ne II
2400	2946.99	W I	250 c	2953.11	Ho II	70	2960.93	Gd II	400 h	2967.21	Br II
200	2947.02	Tm III	500	2953.18	Tm III	300	2961.00	P V	190	2967.22	Ti I
150	2947.06	Dy II	150	2953.19	Sm II	300	2961.01	Os I	140	2967.23	Hf II
400	2947.08	Hg II	55	2953.36	Cr II	2500 r	2961.16	Cu I	1200	2967.28	Hg I
150	2947.21	Dy II	340	2953.56	Ta I	200	2961.242	P IV	1200	2967.283	Hg I
95	2947.28	Mo II	70 s	2953.58	Pr III	55	2961.73	Cr II	70	2967.29	Te II
60	2947.29	Eu II	140	2953.70	Dy II	120	2961.80	Hf II	500 l	2967.45	Rb III
125	2947.32	Mo III	45	2953.71	Cr II	530	2962.15	Os I	10000	2967.54	Pu II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
30	2967.58	Pr II	200	2973.65	Tc I	75	2979.96	Ru II	140	2985.48	Ho II
480	2967.64	Cr I	20	2973.67	Te II	560	2980.15	Gd II	13	2985.54	Fe II
1	2967.87	Mg II	5000	2973.72	Ce III	15	2980.157	Pb I	150	2985.80	Ir I
580	2967.94	U II	18	2973.91	Y II	10000	2980.23	Pu II	500 s	2985.82	Pr III
	2968.	Li I	1200	2974.01	Sc I	55	2980.334	Th II	480	2985.85	Cr I
150	2968.13	Rb III	220	2974.011	Th II	120	2980.41	Ce II	300 h	2985.87	Br II
26	2968.23	Ti I	25	2974.03	Rh I	5	2980.52	Si III	35	2985.88	Yb II
20	2968.38	Cs II	320	2974.10	Nb II	500 s	2980.54	Pr III	110	2985.97	Dy II
600	2968.38	V II	600	2974.24	Na II	30	2980.55	Y II	160	2986.0	S III
230	2968.66	Rh I	210	2974.47	Er II	1000 r	2980.620	Cd I	1500	2986.00	Cr I
270	2968.686	Th II	90 l	2974.52	N V	50	2980.63	Pd II	30	2986.06	Be I
410	2968.76	Er II	480	2974.59	Y I	1100	2980.63	Na II	30	2986.18	Pr II
710	2968.81	Hf II	15	2974.72	Ne I	440	2980.65	Ir I	5	2986.20	K III
150 s	2968.83	Pr III	5	2974.77	Ga II	1400	2980.75	Sc I	450	2986.20	Rh I
170	2968.87	Tb II	100	2974.85	Tm III	150 w	2980.78	N V	100	2986.335	Cu II
320	2968.96	Zr II	30	2974.93	Ti I	350	2980.79	Cr I	10	2986.42	Be I
90	2968.98	Re II	200	2974.95	Ir I	1100	2980.81	Hf I	2100	2986.47	Cr I
350	2969.00	Br III	750	2974.99	Na II	220	2980.82	Re I	350	2986.52	Tm II
160	2969.02	Sm II	80	2975.40	Mo II	15	2980.96	Sb II	300 h	2986.53	Br II
10000 l	2969.13	Bk II	1000	2975.42	Gd III	160	2981.02	Zr II	4	2986.876	Pb II
120	2969.19	Zr I	480	2975.48	Cr I	10000	2981.23	Pu II	10000	2986.95	Pu II
1000 l	2969.29	Am II	430	2975.56	Ta I	250 w	2981.31	N V	90	2986.99	Rh I
120	2969.36	Fe I	230	2975.68	Er II	200 r	2981.362	Cd I	110	2987.03	Tb II
3	2969.41	Ga II	890	2975.88	Hf II	600	2981.445	Fe I	690	2987.16	Co I
80 s	2969.41	Pr III	50	2975.90	Te II	180	2981.46	Ho II	1000 s	2987.24	Am II
340	2969.47	Ta I	50	2976.104	Th I	540	2981.48	Tm II	250	2987.40	Rb III
230	2969.63	Zr II	120	2976.20	V II	120	2981.52	Mo I	50	2987.45	Rh I
2400	2969.82	Lu II	310	2976.29	Re I	570	2981.65	Ni I	410	2987.64	Ho II
800	2970.099	Fe I	410	2976.35	U II	100 l	2981.65	Pr III	150	2987.645	Si I
55	2970.355	Si I	380	2976.52	V II	50	2981.845	Cd I	10000 l	2987.76	Bk II
75	2970.38	Ti I	140	2976.59	Ru II	300	2981.86	Br II	110	2987.92	Mo I
6000	2970.42	Y III	130	2976.61	Zr II	185	2982.0	As III	10000	2988.21	Pu II
80 w	2970.47	Xe III	30	2976.72	Cr II	200	2982.11	C III	360	2988.232	Th II
15	2970.52	Fe II	150 l	2976.86	Pr III	200	2982.11	Nb II	220	2988.47	Re I
2000	2970.56	Yb II	400	2976.91	Ce II	220	2982.19	Re I	110	2988.57	Tb II
500	2970.73	Na II	550	2976.92	Ru I	30 c	2982.29	Eu III	20	2988.63	Ca III
500	2970.74	Rb III	150 s	2977.06	Pr III	150 c	2982.42	Pr III	660	2988.65	Cr I
25	2970.85	Cs II	480	2977.11	W I	45	2982.49	Yb II	160	2988.68	Mo I
740	2970.97	Os I	1000	2977.13	Na II	21	2982.66	Yb II	1400	2988.95	Ru I
1	2971.01	Ga II		2977.21	W I	12	2982.67	Ne I	340	2988.95	Sc I
580	2971.06	U II	45	2977.23	Ru II	210	2982.72	Hf I	2800	2989.03	Bi I
480	2971.11	Cr I	110	2977.42	Dy II	320	2982.74	U II	160	2989.19	Cr II
30	2971.13	Pr II	150	2977.46	Ce II	100	2982.80	In III	18	2989.27	Ca III
40 d	2971.40	Pr II	240	2977.54	V I	510	2982.90	Os I	1800	2989.27	Lu I
	2971.46	Pr II	450	2977.64	Os I	30	2983.00	Sr III	690	2989.59	Co I
110	2971.481	Th II	210	2977.68	Nb II	170	2983.31	Ti I	190	2989.80	Mo I
1 h	2971.52	Si IV	160	2977.68	Rh I	100	2983.43	Sm II	30	2990.22	Pr II
3	2971.60	Ga II	170	2977.78	Tb II	340	2983.49	Os	330	2990.26	Nb II
1	2971.70	Mg II	10000	2977.81	Pu II	1000	2983.570	Fe I	100 h	2990.27	Au II
210	2971.91	Cr II	50	2977.84	Yb III	28	2983.70	Yb II	250	2990.27	Ho II
70	2971.91	Mo II	10	2978.01	Co III	35	2983.74	Gd II	45	2990.37	Yb II
120	2972.25	V II	320	2978.05	Zr II	250	2983.78	O III	630	2990.54	Tm II
500 h	2972.26	Br II	4	2978.14	Pb IV	270	2983.80	Er II	190	2990.62	Ir I
265	2972.29	O I	210	2978.15	Re I	75	2983.94	Mo III	250	2990.87	Ce II
10 c	2972.30	Eu III	180	2978.28	Mo I	200	2983.99	Yb II	3	2991.00	Sn II
10000	2972.50	Pu II	10000	2978.37	Pu II	1000	2984.10	Gd III	150	2991.062	Th II
400	2972.57	Nb II	450	2978.55	P V	250	2984.13	Ni I	10000	2991.31	Pu II
100	2972.58	Ce II	100	2978.87	Cu III	1300	2984.19	Na II	300	2991.33	Eu II
250	2972.61	Mo II	100	2979.050	Ar II	750	2984.26	Y I	40	2991.52	Gd II
400	2972.61	Tm III	230	2979.18	Zr II	530	2984.61	U II	60	2991.57	Sm II
29	2972.74	Gd II	150	2979.28	Hf I	22	2984.75	Ti III	35	2991.62	Ru II
15	2972.991	Pb I	400	2979.32	Xe II	60	2984.77	Fe I	65	2991.87	Yb II
390	2973.00	Ho II	100	2979.34	Tc I	50	2984.82	Fe II	480	2991.89	Cr I
100	2973.10	Ne II	100	2979.46	Ne II	50	2984.98	Pr II	20	2991.89	Co III
1200	2973.132	Fe I	410 c	2979.63	Ho II	90	2985.08	Yb II	40	2992.10	La III
490	2973.22	Tm I	1100	2979.66	Na II	160	2985.243	Th II		2992.12	K I
500	2973.235	Fe I	730 d	2979.71	W I	110	2985.32	Cr II	60	2992.22	Kr III
10	2973.33	Au I	190	2979.74	Cr II	150	2985.36	Tc I		2992.22	K I
110	2973.37	Hf I		2979.86	W I	820	2985.39	Zr I	1800	2992.36	Re I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
6	2992.42	K III	8	2999.64	Ca I	750	3007.44	Na II	430	3014.65	Tm II
500	2992.60	Ni I	170	3000.10	Hf II	40	3007.66	Mn I	40	3014.67	Mn I
800 h	2992.62	C II	20 c	3000.11	Eu III	360	3007.91	U II	710	3014.76	Cr I
410	2992.72	U II	10000	3000.31	Pu II	95	3007.97	Nd II	140	3014.82	V II
1	2992.84	Ga II	120	3000.451	Fe I	150 s	3008.04	Pr III	10000 b	3014.87	Cm II
95	2992.84	Mo II	150 l	3000.46	Pr III	100	3008.08	In III	1400	3014.92	Cr I
40	2992.87	Xe III	70	3000.46	Yb II	320 c	3008.10	Ho II	100 l	3015.13	Pr III
95	2993.04	Gd II	9	3000.86	Ca I	500	3008.14	Fe I	710	3015.19	Cr I
80	2993.20	Nd II	35	3000.87	Ti I	180	3008.497	Th II	1500	3015.30	Tm II
20 p	2993.21	Lu III	1100	3000.89	Cr I	400	3008.79	Ce II	2200	3015.36	Sc I
200	2993.26	Tm II	800	3000.948	Fe I	30	3008.82	In III	600	3015.40	Na II
110	2993.27	Ru I	350	3001.14	Re I	100	3008.85	Pm II	220	3015.68	Dy II
700	2993.34	Bi I	35	3001.17	Pt II	20	3008.86	Co II	500	3016.02	Re I
500 l	2993.51	Am II	260	3001.20	V II	190	3009.09	W I	230	3016.18	Tb II
50	2993.52	Mo II	100	3001.27	Cs II	750	3009.14	Na II	90 s	3016.26	Pr III
400	2993.61	W I	12	3001.62	Fe III	700 r	3009.14	Sn I	10 c	3016.39	Pb II
1000	2993.87	I II	60	3001.655	Fe I	9	3009.21	Ca I	120	3016.43	Ir I
28	2993.94	Yb II	150	3001.67	Ne II	15	3009.22	La III	60	3016.45	Mn I
400	2994.04	Br III	80	3001.84	Nb III	170	3009.30	Tb II	520	3016.47	W I
230	2994.07	Cr I	190	3002.21	Mo I	100	3009.39	Yb II	300 h	3016.48	Br II
200	2994.17	Ac II	220	3002.25	Ir I	450	3009.48	Na II	300	3016.49	Re I
140	2994.28	F III	220	3002.27	Pt I	70000 w	3009.51	La IV	540	3016.78	Hf I
110	2994.42	Ce II	1200	3002.41	Er II	120	3009.569	Fe I	180	3016.78	V II
1000	2994.427	Fe I	4000	3002.49	Ni I	10000	3009.57	Pu II	230	3016.84	Er II
7	2994.44	Sn II	100	3002.61	Sr III	45	3009.78	Pd I	1100	3016.94	Hf II
1000	2994.46	Ni I	25	3002.61	Yb II	10	3010.02	Ar III	270	3017.09	Tm II
250	2994.502	Fe I	15	3002.64	Fe II	2100	3010.13	Gd II	120	3017.19	Ti II
40	2994.73	Nd	310	3002.65	Er II	230	3010.59	Tb II	370	3017.20	Ce II
470	2994.73	Nb II	10	3002.65	Au I	150 l	3010.61	Pr III	300	3017.23	Tc I
300	2994.80	Au II	650	3002.65	Pd I	65	3010.62	Yb II	330	3017.24	Ru I
170	2994.80	Yb II	50	3002.686	Th I	50	3010.736	Th I	570	3017.25	Os I
9	2994.96	Ca I	370	3002.86	Gd II	100	3010.83	Tc I	270	3017.31	Ir I
460	2994.96	Ru I	150 s	3003.20	Pr III	2000	3010.84	Cu I	120	3017.31	Ne II
300	2995.10	Cr I	2500 w	3003.21	Po I	25	3010.92	Co III	450	3017.34	Na II
35	2995.22	Eu II	600	3003.63	Ir I	3000 l	3011.10	Pa II	100 h	3017.43	Xe II
240	2995.26	W I	2200	3003.63	Ni I	40	3011.16	Mn I	770	3017.44	W I
70	2995.26	Y I	320	3003.74	Zr II	40	3011.38	Mn I	160	3017.56	Yb II
320	2995.64	Ce II	300	3003.819	As II	160	3011.69	Ir I	2800	3017.57	Cr I
110	2995.86	Ho II	220	3004.14	Re I	820	3011.75	Zr I	50	3017.58	Te II
28	2995.86	Yb II	550	3004.15	Na II	210	3011.88	Ta I	60	3017.627	Fe I
130	2996.00	Tb II	30	3004.248	Th I	2	3011.90	Ga II	80	3017.63	O III
300	2996.08	Ir I	1000 s	3004.25	Am II	100	3012.	Bi IV	30	3017.88	Pt I
10000	2996.18	Cm II	30	3004.25	Xe III	3700	3012.00	Ni I	4400	3018.04	Os I
10000	2996.40	Pu II	40	3004.46	Mo II	15	3012.02	Te II	980	3018.31	Hf I
700	2996.58	Cr I	110	3004.46	Rh I	80	3012.04	Cs II	95	3018.35	Nd II
950	2996.65	Cl II	100	3004.59	Pm II	1	3012.18	Sn II	125	3018.36	Zn I
140	2996.94	Y I	750	3005.06	Cr I	130	3012.19	Gd II	10 c	3018.43	Eu III
110	2996.986	Th II	100	3005.09	Gd II	200	3012.32	Sr III	430	3018.50	Cr I
15	2997.04	Te II	70	3005.26	Y I	230	3012.47	Er II	20	3018.644	Th I
150 s	2997.12	Pr III	100	3005.37	Zr I	1800	3012.54	Ta II	240	3018.82	Cr I
120 h	2997.21	F III	160	3005.50	Zr I	1100	3012.90	Hf II	1500	3018.85	Y III
8	2997.31	Ca I	130	3005.52	Tb II	140	3013.03	Cr I	55	3018.95	Y I
2000	2997.36	Cu I	800	3005.56	Hf I	330	3013.07	Os I	60	3018.983	Fe I
180	2997.41	Ir I	2	3005.68	I III	5	3013.09	Si III	350	3019.14	Ni I
130	2997.53	F III	310	3005.77	Yb II	15	3013.17	Fe III	130	3019.17	Tb II
260	2997.65	Os I	3	3005.85	Au I	20 c	3013.28	Eu III	140	3019.23	Ir I
1800	2997.97	Pt I	500	3006.06	Cl II	100	3013.32	Zr II	10	3019.29	Sr IV
800	2998.00	Yb III	4	3006.19	La III	130	3013.39	Mo I	60	3019.33	Be I
1000	2998.28	Tm III	40	3006.26	Eu II	40	3013.7	He I	2700	3019.34	Sc I
60 w	2998.43	N V	20	3006.37	Eu III	710	3013.71	Cr I	480	3019.38	Os I
210	2998.79	Cr I	200	3006.42	Re I	230	3013.71	Tm II	30	3019.49	Be I
70 l	2998.79	Pr III	50	3006.43	Rh III	140 h	3013.76	Mo I	30	3019.53	Be I
110	2999.03	Tb II	60 l	3006.47	Pr III	360	3013.79	W I	50	3019.54	Rh I
1200	2999.04	Gd II	440	3006.59	Ru I	1400	3013.93	Y III	20	3019.60	Be I
10000	2999.39	Cm I	50	3006.739	Si I	95	3014.19	Nd II	160	3019.84	Zr II
110 c	2999.40	In II	220	3006.83	N II	20	3014.22	Ba III	30	3019.92	Mn II
120	2999.47	F III	10	3006.86	Ca I	55	3014.43	Yb II	75	3020.004	Si I
500	2999.512	Fe I	12 h	3007.28	Fe III	220	3014.60	Ho II	60	3020.01	Fe II
5500	2999.60	Re I	200	3007.282	Fe I	90 s	3014.60	Pr III	170	3020.29	Tb II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
15	3020.37	Cs II	26	3026.49	Y II	2100	3032.84	Gd II	330	3039.26	Ir I
350	3020.47	Zr II	150	3026.575	Th II	28	3032.93	Cr II	160	3039.31	W I
500	3020.491	Fe I	85	3026.65	Cr II	50	3033.16	Tc I	8000	3039.36	In I
1200	3020.53	Hf I	310 d	3026.67	W I	490	3033.18	U II	100	3039.59	Ne II
3000	3020.54	Lu II	160	3026.67	Yb II	30	3033.25	Au I	200	3039.62	Rb III
1500	3020.639	Fe I	200 c	3026.79	Eu III	100 l	3033.31	Pr III	55	3039.67	Yb II
430	3020.67	Cr I		3026.79	W I	10	3033.44	Ra II	120	3039.75	F III
500	3020.76	Br III	300 w	3026.89	Tc I	240	3033.45	Ru I	80	3039.78	Cr I
310	3020.88	Ru I	300	3027.02	Ne II	270	3033.45	V II	30	3039.93	Sc II
100	3021.01	Sm	120	3027.29	Lu II	50	3033.508	Ar II	20 c	3039.98	Eu III
50	3021.056	Th I	170	3027.33	Tb II	160	3033.56	W I	70	3040.02	Pr III
600	3021.073	Fe I	290 d	3027.48	Ta I	3000 s	3033.59	Pa II	200	3040.31	Ru I
320	3021.22	U II	50	3027.49	Hg I	300	3033.63	Br III	95	3040.60	Mn I
300	3021.50	Hg I	50	3027.490	Hg I	290	3033.82	V II	30	3040.65	Yb III
300	3021.500	Hg I	1900	3027.60	Gd II	12	3034.01	Sb II	12	3040.67	Sb II
20 h	3021.55	Si II	95	3027.77	Mo II	1600	3034.05	Gd II	30	3040.77	Eu II
2800	3021.56	Cr I	1500	3027.91	Pd I	370	3034.065	Th II	550	3040.85	Cr I
150	3021.56	Tc I	500 s	3027.99	Am II	850 r	3034.12	Sn I	2900	3040.90	Os I
100	3021.73	Sr III	500	3028.04	Zr II	390	3034.19	Cr I		3040.91	Cr II
130	3021.73	Y I	320	3028.19	U II	160	3034.19	W I	9	3040.93	Si III
70 s	3021.77	Pr III	270	3028.27	Er II	90 l	3034.25	Pr III	60 c	3040.94	Pr III
20 c	3022.08	Eu III	50	3028.43	Rh I	120	3034.46	Ne II	500	3041.18	Br IV
35	3022.15	Eu I	350	3028.44	Nb II	60	3034.484	Fe I	150	3041.28	Al II
630	3022.21	U II	15	3028.59	Ca III	2	3034.54	Ca I	220	3041.3	Se II
90	3022.28	Y I	10000	3028.85	Pu II	80	3034.57	Tc I	200	3041.48	Rb III
50	3022.30	Kr III	100 l	3028.86	Am II	55	3034.64	Yb II	20 h	3041.57	Si II
60	3022.59	Co II	300	3028.86	Ne II	6	3034.73	Si III	80	3041.637	Fe I
100	3022.66	Tc I	120	3028.98	Gd II		3034.76	K I	300	3041.70	Mo I
50 c	3022.69	Eu III	5	3029.01	Tl II	150	3034.84	Sm II	440 d	3041.73	W I
10000	3022.75	Ce III	400	3029.07	Na II	60	3034.87	Bi I	55	3041.74	Cr II
70	3022.75	Mn I	3	3029.12	Li II		3034.92	K I	60 l	3041.78	Pr III
20	3023.31	Te II	3	3029.14	Li II	170	3035.110	Th II		3041.86	W I
20 c	3023.40	Eu III	170	3029.16	Cr I	30	3035.13	Co II	100	3042.	Bi IV
110	3023.43	Tb II	320	3029.20	Au I	30	3035.35	Mn II	290	3042.06	Ta II
80	3023.45	O III	380	3029.36	Ir I	10	3035.72	Cd III	30 h	3042.19	Si II
120	3023.47	Hg I	100 l	3029.38	Pr III	200	3035.78	Zn I	100 s	3042.35	Pr III
120	3023.476	Hg I	2000	3029.49	Yb III	100	3035.92	Ne II	280	3042.35	Tm II
350	3023.61	Rb III	880	3029.52	Zr I	2500	3036.10	Cu I	220	3042.48	Ru I
200	3023.68	Tc I	140	3029.73	Ti II	310	3036.22	Er II	10000	3042.61	Pu II
100	3023.81	Xe III	210	3029.81	Dy II	100	3036.31	Mo I	800	3042.64	Pt I
130	3023.91	Rh I	500 r	3029.83	Sb I	350 d	3036.39	Zr II	40	3042.64	Tc I
100 c	3023.93	Eu III	50 c	3029.92	Eu III	350	3036.45	Br III	35	3042.65	Ir II
8	3023.94	Sn II	100 h	3030.00	Si II	130	3036.45	Pt I	80	3042.65	Yb II
500	3024.032	Fe I	80	3030.148	Fe I	30	3036.59	Y II	27	3042.73	Mn I
12	3024.05	Ar III	710	3030.24	Cr I	40	3036.88	Tc I	120	3042.74	Os II
1100	3024.35	Cr I	380	3030.45	Re I	40	3036.96	Fe II	160	3042.80	F III
80	3024.45	Kr III	40	3030.487	Th I	20 c	3036.98	Eu III	130	3043.01	Gd I
110	3024.50	W II	50	3030.60	Cd II	550	3037.04	Cr I	80	3043.02	O III
320	3024.51	U II	1100	3030.70	Os I	400	3037.08	Na II	10000	3043.12	Pu II
2400	3024.64	Bi I	360	3030.76	Sc I	8	3037.29	Si III	230	3043.12	V I
10	3024.67	Au I	100	3030.79	Ne II	800	3037.389	Fe I	280	3043.13	Dy II
140	3024.74	Nb II	180	3030.92	Zr II	100	3037.72	Ne II	50	3043.29	Nd
210	3024.93	W I	55	3031.06	Mn II	210	3037.73	Ce II	500	3043.30	Ac II
2	3024.94	Ca I	920	3031.11	Yb II	20	3037.90	Tc II	85	3043.36	Mn I
250	3025.00	Mo I	410	3031.16	Hf II	1700	3037.94	Ni I	30	3043.42	Ba III
70 s	3025.26	Pr III	60	3031.214	Fe I	6	3037.98	Ar IV	210	3043.50	Os I
80	3025.26	Tc I	30 h	3031.22	Pt II	25	3037.99	Yb II	230	3043.56	V I
140	3025.29	Hf II	20 c	3031.24	Eu III	100	3038.23	Tc I	100 h	3043.69	Si II
10	3025.32	Eu III	370	3031.31	Er II	610	3038.28	Dy II	270	3043.80	W I
30	3025.608	Hg I	140	3031.35	Cr I	500 l	3038.36	Am II	10	3043.85	Pb III
30	3025.61	Hg I	50000	3031.58	Ce III	85	3038.598	Th II	10 h	3043.85	Si II
150	3025.638	Fe I	230	3031.60	Tb II	10	3038.64	Eu III	7	3043.93	Si III
110	3025.82	Ir I	100	3031.62	Yb III	270	3038.69	Ho II	3100	3044.00	Co I
500	3025.842	Fe I	120	3031.87	Ni I	220	3038.7	Se II	21	3044.00	Yb II
290	3025.95	Er II	630	3031.99	U II	50	3038.98	Nd II	100	3044.09	Ne II
330	3026.07	Tm II	110	3032.26	B II	10	3039.05	Eu III	490	3044.16	U II
10 c	3026.09	Eu III	300	3032.77	Nb II	750	3039.067	Ge I	330	3044.57	Mn I
390	3026.16	Dy II	200	3032.80	Sn I	100	3039.13	Sm II	100	3044.76	Nb II
80	3026.47	Nd II	40 c	3032.84	Eu III	130	3039.25	F III	45	3044.84	Y I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
10000	3044.85	Cm II	1000	3051.36	Rb II	950	3057.96	Cl II	110	3065.69	Tb II
230	3044.94	V I	100 h	3051.55	Tc I	170	3058.09	Ti II	170	3066.02	Mn I
230	3044.96	Tb II	200	3051.98	Ce II	8600	3058.66	Os I	60	3066.14	Al I
150	3045.01	Ni I	6	3052.07	K III	550	3058.72	Na II	230	3066.22	Er II
5	3045.08	Si III	80	3052.15	Nd II	200	3058.78	Re I	500	3066.22	Na II
190	3045.37	Y I	50	3052.44	Rh III	150 l	3058.90	Pr III	1300 d	3066.22	Ti II
100	3045.56	Ne II	20	3052.46	Te II	120	3058.98	Eu I		3066.35	Ti II
130	3045.564	Th II	40	3052.47	Tc I	1000	3059.086	Fe I	2400	3066.38	V I
120	3045.59	Mn I	4	3052.56	Pb IV	100	3059.11	Ne II	500	3066.54	Na II
400	3045.60	Na II	85	3052.93	Sc II	110	3059.30	O III	100	3066.60	Cs II
110	3045.71	Ru I	110	3053.09	Nb I	24	3059.52	Cr II	100 c	3066.60	Tc I
70	3045.72	Sc II	150 h	3053.18	Si II	85	3059.74	Ti II	150 l	3066.71	Pr III
2	3045.74	Ca I	130	3053.24	Tb II	30	3059.83	Sr III	220	3066.99	Dy II
30	3045.77	Rh I	180	3053.39	V II	100	3059.92	Gd I	600	3067.021	Ge I
10 h	3045.77	Si II	460	3053.55	Tb II	120	3059.99	F II	200	3067.12	V II
100 l	3045.81	Pr III	280	3053.57	Gd II	100 h	3060.08	Hf III	28	3067.16	Cr II
100	3045.83	Zr I	450	3053.65	V I	100	3060.11	Zr II	230	3067.20	Tb II
110	3046.08	Hf II	550	3053.67	Na II	700	3060.25	Na II	250	3067.244	Fe I
440	3046.44	W I	200 s	3053.69	Am II	290	3060.30	Os I	65	3067.30	Rh I
160	3046.48	Gd I	710	3053.88	Cr I	10000	3060.32	Pu II	1600	3067.40	Re I
45	3046.48	Yb II	410 c	3054.00	Ho II	1400	3060.46	V I	850	3067.41	Hf I
10	3046.52	Be II	10	3054.07	Eu III	280	3060.64	Dy II	150	3067.54	Sm
110	3046.68	Ti II	1500	3054.32	Ni I	100	3060.78	Mo II	9000 c	3067.72	Bi I
30	3046.69	Be II	100	3054.34	Ne II	15	3060.98	Cs II	450	3067.729	Th II
30	3046.76	Rh I	250	3054.36	Mn I	800	3061.35	Na II	100	3068.00	Mo I
340 d	3046.76	Tm II	210	3054.42	Er II	50	3061.43	Sr III	7	3068.24	Si III
150	3046.80	Mo I	60	3054.68	Al I	160	3061.59	Mo I	120 c	3068.34	Tc I
50	3046.93	Kr III	100	3054.68	Ne II	460	3061.62	U II	1000	3068.64	Gd II
120	3046.93	Sm II	12	3054.82	Ar III	220	3061.699	Th II	1600	3068.89	Ir I
70 l	3046.98	Pr III	690	3054.84	Zr II	1700	3061.82	Co I	270	3069.03	Tb II
70	3047.00	Te II	320cw	3054.94	Eu II	80	3062.11	Tc I	190	3069.09	Ir I
200	3047.04	Mn I	150	3054.94	Ru I	140	3062.12	Mn I	35	3069.11	Eu II
35	3047.05	Yb II	10 c	3054.97	Eu III	5	3062.18	K II	4	3069.17	I IV
22	3047.11	Y I	1000	3055.10	Er III	570	3062.19	Os I	3	3069.23	I III
200	3047.13	O III	60	3055.22	Y II	200	3062.36	Tc I	530	3069.24	Ta I
300	3047.16	Ir I	350	3055.24	Ce II	100	3062.49	Ne II	450	3069.31	Po I
240	3047.25	Re I	70 s	3055.30	Pr III	630	3062.54	U II	10000	3069.32	Pu II
210	3047.31	Mo I	3	3055.32	Ca I	390	3062.62	Dy II	200	3069.36	Ac II
12	3047.50	Sn II	210	3055.32	Mo I	130	3062.78	Tb II	140	3069.64	V I
210	3047.56	Dy II	550	3055.35	Na II	680	3063.01	Ce II	110	3069.68	Nb II
120	3047.56	Ne II	100	3055.52	Nb II	45	3063.12	Yb II	190	3069.71	Ir I
800	3047.604	Fe I	95000	3055.59	Ce III	500	3063.13	Cl IV	130	3069.73	Nd II
150	3048.10	Nb I	340	3056.07	Tm II	60	3063.13	Kr III	210	3069.94	Os I
100	3048.11	Tm III	550	3056.16	Na II	10	3063.16	Te II	320	3069.94	Re I
230	3048.22	V II	120 h	3056.31	Sc I	140	3063.25	V II	460	3070.05	Tb II
50 h	3048.30	Si II	1200	3056.33	V I	100	3063.30	Ne II	170	3070.27	Mn I
110	3048.66	W I	20000	3056.56	Ce III	2500	3063.41	Cu I	1000	3070.40	Er III
110	3048.78	Ru I	90000 c	3056.68	La IV	460	3063.42	O IV	250	3070.70	Rb III
40	3048.86	Mn I	30	3056.692	Th I	21	3063.67	Yb II	450	3070.74	Er II
420	3049.092	Th II	140	3056.71	Nd II	130	3063.78	Hf I	100	3070.89	Ne II
150	3049.14	F III	30	3056.72	Kr III	230	3064.09	Tb II	250	3070.90	Mo I
480 c	3049.38	Ho II	2100	3056.72	Lu II	800	3064.28	Mo I	100	3070.90	Nb II
300	3049.44	Ir I	130	3056.74	Ti II	90	3064.29	Al I	260	3071.16	Re I
230	3049.46	Os I	320	3056.78	Ce II	500	3064.38	Na II	3000 l	3071.24	Pa II
530	3049.56	Ta I	5	3056.84	K III	220	3064.53	Nb II	70	3071.24	Ti II
810	3049.69	W I	1100	3057.02	Hf I	500	3064.62	Ni I	120	3071.29	Sm II
360	3050.07	Al I	450	3057.14	Al I	100	3064.63	Zr II	1300	3071.32	Cl II
110	3050.14	Cr II	40000	3057.23	Ce III	300	3064.67	Tc I	65 d	3071.43	Nd II
580	3050.20	U II	300	3057.28	Ir I	130	3064.68	Hf II		3071.50	Nd II
120 l	3050.30	Pr III	550	3057.38	Na II	3200	3064.71	Pt I	100	3071.53	Ne II
210	3050.39	Os I	130	3057.40	Ti II	10	3064.77	Ar III	110	3071.56	Nb II
30	3050.65	Mn II	600	3057.446	Fe I	390	3064.84	Ru I	2	3071.57	Ca I
320	3050.73	Tm II	500 c	3057.45	Ho II	110	3064.93	W I	100 r	3071.58	Ba I
710	3050.76	Hf I	20000	3057.58	Ce III	250	3065.04	Mo II	410	3071.61	O IV
3500	3050.82	Ni I	1900	3057.64	Ni I	110	3065.04	Yb II	5	3071.84	Ge IV
170	3050.89	V I	1000	3057.86	Lu III	85	3065.07	Cr I	330	3071.91	Dy II
50	3051.11	Nd II	25	3057.89	Rh I	130	3065.11	Sc II	30	3071.94	Pt I
190	3051.13	Tb II	630	3057.91	U II	1100	3065.31	Pd I	200	3072.06	Zn I
8 d	3051.15	In I	550	3057.95	Na II	300	3065.42	Au I	600	3072.11	Ti II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
370	3072.114	Th II	700	3078.87	Tm III	340	3088.76	Re I	320	3095.75	U II
300	3072.41	Pm II	40	3079.14	Ba III	4	3089.08	Pb III	110	3095.82	Zr I
560	3072.53	Er II	95	3079.38	Nd II	10 c	3089.09	Eu III	28	3095.86	Cr I
560	3072.56	Gd II	90	3079.63	Mn I	100	3089.10	Yb II	95	3095.88	Y II
270	3072.60	Tb II	150	3079.88	Mo I	100	3089.12	Mo I	15	3096.26	La III
580	3072.78	U II	390	3080.11	Lu I	170	3089.14	Ru I	330	3096.57	Ru I
2100	3072.88	Hf I	150 l	3080.20	Pr III	150	3089.34	Tc I	200	3096.76	Hf I
200	3072.96	Re I	480	3080.217	Th II	35	3089.35	Eu II	16	3096.83	Si III
1100	3072.97	Ti II	550	3080.25	Na II	180	3089.40	Ti II	120	3096.88	Sm II
580	3073.08	Tm II	110	3080.35	Nb II	480	3089.58	Tb II	14	3096.90	Mg I
160	3073.13	Mn I	210	3080.41	Mo I	100	3089.71	Mo I	40	3097.06	Mn I
100	3073.24	Nb II	150	3080.66	Hf II	120	3089.80	Ru I	260	3097.12	Ni I
180	3073.28	W I	420	3080.76	Ni I	280	3089.95	Gd II	100	3097.13	Ne II
610	3073.34	Er II	2	3080.79	Ca I	15	3090.05	Hg III	40	3097.16	Kr III
280	3073.54	Dy II	150	3080.822	Cd I	230	3090.08	Os I	180	3097.19	Ti II
15	3073.56	Te II	430	3080.84	Hf I	130	3090.093	Th II	140	3097.266	Th II
85	3073.68	Cr I	25	3080.87	Cs II	120	3090.19	Pm II	120	3097.45	Eu II
1400	3073.80	Cu I	95	3080.94	Nd II		3090.3	Be I	110	3097.5	S IV
170	3073.82	V I	360	3081.12	Tm I	200	3090.37	Ce II	120	3097.60	Ru I
360	3074.08	Os I	50	3081.33	Mn I	20	3091.08	Mg I	320	3098.01	U II
170	3074.10	Hf I	5100 h	3081.47	Lu I	50	3091.1	Xe III	80	3098.189	Fe I
230	3074.30	Ho II	25	3081.48	Cd II	10000	3091.33	Pu II	140	3098.48	Nd II
550	3074.33	Na II	2100	3081.99	Gd II	20	3091.56	Tl II	100	3098.49	Rb III
800	3074.37	Mo I	2	3082.02	Rb I	120	3091.577	Fe I	740	3098.60	Tm II
500	3074.42	Br III	23	3082.05	Mn I	55 h	3091.70	Y I	460	3098.64	Gd II
150	3074.64	Al II	720	3082.08	Er II	150	3091.86	Pm II	190	3098.90	Gd II
250	3074.79	Hf I	110	3082.11	Pr II	350	3091.94	Br III	20	3099.10	Ag I
290	3074.96	Os I	150	3082.11	V I	10000	3091.94	Pu II	1000	3099.10	Tc I
100	3075.17	La III	4500 r	3082.153	Al I	550	3092.04	Na II	210	3099.12	Ni I
1600	3075.22	Ti II	500 c	3082.34	Ho II	140	3092.06	Gd II	370	3099.19	Er II
100	3075.27	V I	480	3082.36	Tb II	190	3092.07	Mo II	140	3099.19	Nb II
160	3075.38	Nd II	550	3082.43	Re I	100	3092.09	Ne II	280	3099.23	Zr II
120	3075.719	Fe I	30	3082.593	Cd I	1400	3092.19	Cl II	830	3099.28	Ru I
100	3075.73	Ne II	3000 h	3083.19	Pa	100	3092.31	Cs II	2	3099.30	Ca I
150	3075.90	Zn I	320	3083.22	Ir I	100	3092.34	Cd II	55	3099.52	Nd II
18	3076.01	Yb II	40	3083.5	Xe III	3000	3092.50	Yb III	200	3099.52	Tc I
10	3076.06	Ta IV	320	3083.67	Ce II	10000	3092.59	Pu II	110 d	3099.80	In II
35	3076.07	Eu II	180	3083.96	Rh I	7200 r	3092.710	Al I	100	3099.895	Fe I
80	3076.24	Tc I	140	3084.01	Gd II	95	3092.73	Nd	1250	3099.93	Cu I
20	3076.43	Eu III	610	3084.02	Er II	550	3092.73	Na II	110	3099.93	Mo I
140	3076.66	Bi I	910	3084.36	Ho II	1800 r	3092.839	Al I	100	3099.968	Fe I
600	3076.68	Cl IV	250	3084.44	Ce II	120	3092.90	Ne II	130	3100.04	Pt I
170	3076.69	Ir I	180 d	3084.83	W I	240	3092.92	Nd II	510	3100.29	Ir I
400	3076.87	Nb II		3084.91	W I	22	3092.99	Mg I	60	3100.303	Fe I
640	3076.92	Gd II	40000	3085.10	Ce III	580	3093.01	U II	500	3100.40	Er III
2	3076.95	Ca I	110	3085.34	Zr I	25	3093.03	La III	510	3100.45	Ir I
150	3077.08	Gd II	4	3085.38	La III	3800	3093.11	V II	3500	3100.50	Gd II
360	3077.24	Ta I	800	3085.62	Mo I	3000 l	3093.23	Pa II	100	3100.665	Fe I
220	3077.36	Eu II	150	3086.02	Pm II	50	3093.402	Ar II	700	3100.67	Re I
8	3077.40	Ar IV	100	3086.04	Ac II	20	3093.42	Si III	180	3100.67	Ti I
290	3077.44	Os I	25	3086.24	Si III	370	3093.50	W I	28	3100.74	Yb I
110	3077.52	W II	240	3086.44	Ir I	270	3093.59	Os I	740	3100.84	Ru I
7500	3077.60	Lu II	100	3086.45	Sm II	200	3093.64	Re I	110	3100.88	Mo I
85	3077.66	Mo II	6	3086.46	Si III	5	3093.65	Si III	180	3100.94	V II
1100	3077.72	Os I	430 c	3086.54	Ho II	50	3093.711	Th I	120	3101.18	Gd II
55	3077.83	Cr I	120	3086.78	Tb II	22	3093.76	Y II	560	3101.34	Mo I
100	3078.07	Ac II	500	3086.84	Rb III	70	3093.87	Yb II	45	3101.36	Yb II
360	3078.11	Os I	60	3086.85	Y II	1500	3093.99	Cu I	340	3101.40	Hf II
10	3078.15	Ar III	550	3087.06	Na II	100	3094.01	Ne II	310	3101.53	Os I
90	3078.25	N IV	100	3087.37	Ac II	1800	3094.18	Nb II	2600	3101.55	Ni I
550	3078.32	Na II	29	3087.42	Rh I	200	3094.20	V II	4	3101.79	K I
230	3078.38	Os I	270	3087.62	Mo II	650	3094.45	Na II	180 c	3101.8	In II
2300	3078.64	Ti II	3600	3088.02	Ti II	560	3094.66	Mo I	5	3101.80	Ra I
220	3078.68	Dy II	390	3088.04	Ir I	6	3094.69	Sn II	1300	3101.88	Ni I
70 s	3078.68	Pr III	120	3088.17	Ne II	110	3094.80	Zr I	230	3101.91	Gd II
5000	3078.75	I II	450	3088.26	Na II	200	3095.06	Re I	280	3101.93	Dy II
670	3078.828	Th II	250	3088.43	Tb II	250	3095.07	Zr II	3	3102.04	K I
670	3078.86	Tb II	240	3088.470	Th II	100	3095.10	Ne II	28	3102.07	Yb II
210	3078.87	Er II	250	3088.58	Rb II	650	3095.55	Na II	20	3102.18	Yb III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
100 h	3102.30	Sm II	7	3110.41	Ar III	310	3118.33	Os I	680	3124.95	U II
3000	3102.30	V II	30000	3110.53	Ce III	2000	3118.38	V II	380	3124.97	Ta I
580	3102.39	U II	50	3110.67	Ti II	3000	3118.43	Lu I		3125.02	Cr II
230	3102.54	Tb II	40	3110.68	Mn I	760	3118.50	Ho II	10	3125.18	Ca II
580	3102.55	Gd II	2600	3110.71	V II	120	3118.60	Gd II	600	3125.21	Na II
10	3102.63	Au I	10	3110.81	Be I	240	3118.65	Cr II	1500	3125.28	V II
200	3102.664	Th II	28	3110.86	Cr I	100	3118.76	Pm II	480	3125.507	Th II
4	3102.74	Pb III	340	3110.86	Re I	150	3118.894	Pb I	400	3125.67	Hg I
480	3102.96	Tb II	130	3110.87	Hf II	120	3118.92	Rb III	400	3125.670	Hg I
140	3103.06	Re II	210	3110.88	Zr II	120	3119.01	Gd I	320	3125.92	Zr II
220	3103.24	Dy II	10	3110.92	Be I	80	3119.17	Tc I	120	3125.96	Ru I
560	3103.25	Ta I	20	3110.99	Be I	30	3119.22	Ba III	4000	3126.01	Yb III
370	3103.38	Ce II	250	3111.09	Os I	45	3119.25	Cr I	1400 h	3126.11	Cu I
500	3103.58	Na II	300	3111.17	Ce II	530	3119.35	U II	10	3126.199	Ne I
230	3103.80	Ti II	170	3111.19	Gd I	510	3119.526	Th II	260	3126.22	V II
30	3103.92	Ba III	100	3111.34	Pr II	290	3119.62	Tb II	3000 l	3126.23	Pa II
10000	3104.12	Pu II	500	3111.36	Rb III	40	3119.66	Tc I	6	3126.27	Si III
460	3104.15	U II	950	3111.43	Eu I	19	3119.67	Ca III	30	3126.86	Au II
30	3104.25	Sr III	150	3111.45	Nb I	40	3119.71	Cr I	30	3127.03	Au I
500	3104.40	Na II	450	3111.45	Na II	720	3119.72	Ti I	220	3127.53	Ce II
8	3104.44	Te II	970	3111.62	U II	50	3119.75	Nd II	270	3127.53	Nb II
600	3104.46	Cl III	45	3111.81	Y I		3119.80	Ti II	7	3127.90	Ar III
180	3104.59	La II	200	3111.97	La III	510	3119.94	Gd II	330	3128.41	Dy II
9	3104.71	Mg II	55	3112.04	Y II	130	3119.98	Hf I	130	3128.56	Gd II
8	3104.81	Mg II	1400	3112.12	Mo I		3120.	Be I	120	3128.70	Cr II
6	3105.00	K II	60	3112.25	Kr III	200	3120.15	Tm III	60	3128.77	Y II
10000	3105.04	Pu II	50	3112.48	Ti I	100	3120.16	Ac II	300	3128.87	Xe II
230	3105.08	Ti II	10	3112.57	Rb I	100	3120.18	Gd II	420	3128.94	Re I
10	3105.25	Eu III	200	3112.83	Ac II	260	3120.18	W I	500	3129.18	Zr II
130	3105.43	Nd II	3	3113.06	Rb I	430	3120.37	Cr II	10	3129.31	Eu III
220	3105.47	Ni I	160	3113.17	Gd II	2000 s	3120.49	Am II	600	3129.38	Na II
360	3105.99	Os I	310 d	3113.43	Er II	30	3120.61	Kr III	220	3129.44	O II
10000	3106.03	Pu		3113.54	Er II	350	3120.74	Zr I	500	3129.76	Zr II
320	3106.18	Eu I	140	3113.62	F III	340	3120.76	Ir I	80	3129.93	Y II
95	3106.18	Nd II	500	3113.69	Na II	380	3121.14	V II	30 h	3130.02	Ag I
260	3106.23	Ti II	2600	3114.04	Pd I	340	3121.36	Re I	530	3130.27	V II
30	3106.46	Xe III	270	3114.12	Ni I	180	3121.54	F III	200	3130.33	Ce II
250	3106.52	Sm II	22	3114.28	Y I	30000	3121.56	Ce III	480	3130.42	Be II
690	3106.58	Zr II	250 s	3114.82	Rb III	140	3121.58	Pr II	380	3130.58	Ta I
230	3106.78	Er II	70	3114.91	Rh I	80	3121.71	O III	120	3130.73	Eu II
70	3106.81	Ti I	35	3115.0	Bi III	140	3121.76	Rh I	1500	3130.79	Nb II
20000	3106.98	Ce III	260	3115.18	Nd II	200	3121.78	Ir I	35	3130.79	Rh I
240	3107.23	W I	85	3115.34	Yb II	230	3121.94	Tb II	240	3130.80	Ti II
200	3107.47	Ce II	100	3115.36	Pm II	290	3122.00	Mo II	130	3130.81	Gd II
55	3107.76	Yb II	50	3115.538	Th I	100	3122.50	Au II	240	3130.87	Ce II
170	3107.90	Yb II	160	3115.70	F III	28	3122.60	Cr II	300 c	3130.99	Ho II
65	3108.01	Nd II	200	3115.95	Po	160	3122.62	O II	320	3131.07	Be II
240	3108.02	W I	60	3115.98	Tc I	700	3122.64	Tc I	150	3131.070	Th II
150	3108.11	Pm II	190	3116.15	Nd II	770	3122.72	Er II	140	3131.11	Zr I
10 h	3108.21	Ba I	100	3116.263	Th I	1600	3122.78	Au I	480	3131.12	Os I
60	3108.25	Tc I	10000	3116.41	Cm I	150	3122.90	V II	1500	3131.23	Tc I
510	3108.296	Th II	300	3116.516	As II	400	3122.94	Na II	7400	3131.26	Tm II
200	3108.31	Ho II	1000	3116.59	Gd III	510	3122.963	Th II	110	3131.35	Tb II
130	3108.36	Gd II	10	3116.68	Co III	230	3123.05	Tb II	320	3131.55	Hg I
110	3108.37	Zr I	55	3116.70	Yb II	160	3123.06	Nd II	320	3131.551	Hg I
2000	3108.60	Cu I	50	3116.74	La III	190	3123.07	Ti I	710	3131.81	Hf I
150	3108.8	As IV	10 h	3117.01	Au I	240	3123.70	Rh I	320	3131.84	Hg I
700	3108.81	Re I	100	3117.22	Pm II	1200	3123.72	Cl II	320	3131.842	Hg I
310	3108.98	Os I	350	3117.29	Br III	10000	3123.87	Pu II	590	3132.06	Cr II
710	3109.12	Hf II	230	3117.57	W I	370	3123.99	Gd II	350	3132.07	Zr I
40	3109.15	Tc I	140	3117.67	Ti II	120	3124.25	Gd II	40	3132.16	Eu I
28	3109.34	Cr I	40	3117.7	S IV	370	3124.387	Th II	290	3132.52	Er II
620	3109.38	Os I	200	3117.72	Sm II	100	3124.39	Kr III	10	3132.58	Te II
10	3109.67	Eu III	190	3117.81	Yb II	1700	3124.42	Na II	14000	3132.59	Mo I
10000	3109.69	Cm I	290	3117.89	Tb II	160	3124.54	Tb II	8	3132.60	Ba I
410	3109.76	Dy II	100	3117.98	Ne II	190	3124.58	Nd II	270	3132.64	Ta I
200 c	3109.91	Ho II	2500	3118.04	Gd III	140	3124.79	F III	470	3132.77	Er II
220	3110.20	Sm II	120	3118.16	Ne II	20	3124.816	Ge I	110	3132.86	O III
320	3110.28	Ce II	340 c	3118.19	Re I	470	3124.94	Cr II	100	3133.09	Gd II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
200	3133.167	Cd I	250	3141.38	Re I	5000 c	3148.90	Rb II	12	3158.05	Ba I
110	3133.23	Zr I	130	3141.42	W I	680	3149.24	U II	6000	3158.16	Mo I
3400	3133.32	Ir I	170	3141.46	Nd II	2000	3149.28	Na II	1	3158.18	Ga II
410	3133.33	V II	140	3141.54	Ti I	100	3149.29	Nd II	5	3158.26	Rb I
350	3133.48	Zr II	95	3141.67	Ti I	100	3149.51	Nd II	360 c	3158.31	Re I
290	3133.60	Nd II	80	3141.73	Yb II	7	3149.56	Si IV	100 c	3158.40	In II
460	3133.85	Gd II	60	3141.84	Sn I	65	3149.85	W II	12 h	3158.54	Ba I
160	3133.88	W I	3	3142.01	Kr IV	45	3149.88	Eu II	10000	3158.60	Cm I
2300	3133.89	Tm II	80	3142.26	Nb III		3150.	Be I	200	3158.63	Gd I
260	3134.02	Re I	170	3142.44	Nd II	40 c	3150.26	Tc I	170	3158.87	Ca II
2900	3134.11	Ni I	200	3142.48	V II	150	3150.455	Th II	190	3159.15	Ir I
140	3134.23	F III	10	3142.54	Eu III	190	3150.61	Ir I	10000	3159.21	Pu II
250	3134.26	Tb II	80 c	3142.75	In II	7	3150.75	Ca I	200 c	3159.67	Ho II
200 c	3134.39	Ho II	130	3142.76	La II	80 c	3150.82	Xe III	270	3159.82	Hf I
850	3134.72	Hf II	270	3142.81	Pd I	1900	3151.04	Tm II	290	3159.92	Ru I
450	3134.82	O II	420	3142.835	Th II	45	3151.36	Rh I		3160.6	Be I
220	3134.90	Nd II	230	3143.13	Gd II	2	3151.40	Co III	20	3160.66	Te II
210	3134.93	V II	100	3143.72	Ne II	100	3151.44	Yb III	140	3160.69	Gd II
210	3135.03	Gd II	220	3143.76	Ti II	120	3151.63	Hf I	1200	3161.00	Rb II
95	3135.17	Y II	220	3143.83	Dy II	440	3151.64	Re I	200	3161.03	I II
830	3135.38	Dy II	20000	3143.96	Ce III	140	3151.87	Nb I	90 h	3161.04	Mn I
2500	3135.48	Na II		3144.	Li I	180	3152.10	Sm II	500	3161.20	Ti II
8 h	3135.72	Ba I	250	3144.33	Er II	240	3152.25	Ti II	30	3161.364	Th I
	3136.	Be I	300 c	3144.36	Ho II	410	3152.52	Sm II	980	3161.37	Gd II
5	3136.02	Ca I	100	3144.55	Nd II	45	3152.60	Rh I	8	3161.61	Si III
100	3136.216	Th I	200	3144.60	Ce II	250	3152.67	Os I	300	3161.67	Tc I
270	3136.30	Sm II	160	3144.66	O V	30	3152.70	Ba III	10000	3161.73	Pu II
10 p	3136.43	Fe III	100	3144.82	Nd II	220	3152.82	Mo II	780	3161.77	Ti II
150	3136.51	V II	230	3144.90	Tm II	500 s	3153.09	Ac II	200 s	3161.83	Am II
140	3136.68	Cr II	410	3144.97	U II	530	3153.11	U II	35	3162.23	Pm I
50	3136.76	Yb II	930	3145.00	Gd II	28	3153.18	Yb II	28	3162.29	Yb I
190	3136.93	Gd I	80	3145.06	Yb II	140	3153.49	F II	150	3162.30	Sm II
180	3136.96	Zr I	230	3145.22	Tb II	290	3153.61	Os I	130	3162.42	Tb II
10000	3137.16	Cm I	290	3145.28	Ce II	330	3153.79	Re I	1000	3162.57	Ti II
100	3137.24	Nd II	220	3145.32	Hf II	120	3153.82	Ru I	710	3162.61	Hf II
190	3137.30	Gd I	150	3145.34	V II	3	3153.88	I III	100	3162.62	Nd II
130	3137.51	Hf I	390	3145.40	Nb II	90	3153.88	Yb II	670	3162.83	Dy II
10	3137.70	Ba I	370	3145.52	Gd II	12	3154.20	Fe II	290	3162.93	Tb II
95	3137.71	Rh I	28	3145.54	Yb II	240	3154.20	Ti II		3163.	Be I
10	3137.81	Pb III	490	3145.56	U II	410	3154.29	Er II	10000	3163.18	Pu II
1700	3137.86	Na II	950	3145.71	Na II	310	3154.300	Th II	1200	3163.40	Nb II
100 w	3138.3	Xe III	55	3145.72	Ni I	600 s	3154.41	Ac II	290	3163.42	W I
285	3138.44	O II	310	3146.044	Th II	190	3154.74	Ir I	6	3163.53	Tl III
1000	3138.58	Yb III	250	3146.16	Dy II	10000	3155.10	Cm I	140	3163.73	Pr II
130 c	3138.60	In II	230	3146.16	Tm II	100	3155.15	Cr I	2000	3163.74	Na II
690	3138.68	Zr II	3000 l	3146.28	Pa II	50	3155.18	Yb II	100	3163.76	Cr I
120	3138.71	Gd I	290	3146.41	Ce II	3	3155.31	Li II	70	3163.80	Yb II
110	3138.72	Mo II	150	3146.67	Tb II	4	3155.33	Li II	290	3164.15	Ce II
420	3139.306	Th II	130 d	3146.70	In II	10	3155.34	Ba I	540	3164.31	Zr II
800	3139.34	Cl III	50	3146.79	Cd II	120	3155.62	Tb II	100	3164.43	Ne II
320	3139.39	Pt I	230	3146.88	Gd II	55	3155.64	Mo II	130	3164.44	W I
530	3139.61	U II	140	3146.99	F III	10	3155.67	Ba I	220	3164.52	Re I
440	3139.64	Tb II	310	3147.04	Tb II	240	3155.67	Ti II	120	3164.53	Mo I
170	3139.65	Hf II	20000	3147.06	Ce III	290	3155.67	Zr II	200 s	3164.81	Ac II
150	3139.74	V II	310	3147.15	Tb II	150	3155.77	In II	10	3164.88	Au I
45	3139.75	Sc II	150	3147.19	Sm II	130	3155.78	Rh I	50	3165.21	Yb II
140	3139.80	Zr I	140	3147.23	Cr II	200	3156.18	Ho II	130	3165.38	W I
150	3139.97	Sm II	10000	3147.33	Cm I	3100	3156.25	Os I	150	3165.45	Zr II
190	3140.06	Tb II	220	3147.35	Mo I	1200	3156.52	Dy II	25	3165.60	Ba I
360	3140.64	Dy II	7	3147.37	Si III	980	3156.53	Gd II	100	3165.65	Ne II
120	3140.76	Hf II	300	3147.81	Br III	140	3156.56	Pt I	9	3165.71	Si IV
6	3140.79	Ca I	240	3148.04	Ti II	450	3156.63	Hf I	190	3165.74	Tb II
230	3140.94	Yb II	60 h	3148.18	Mn I	250	3156.78	Os I	880	3165.97	Zr II
410	3141.10	Er II	220	3148.41	Hf I	270	3156.97	Ho II	140	3166.099	Th II
500	3141.14	Dy II	85	3148.44	Cr I	150	3157.00	Zr II	1500	3166.25	Er III
	3141.15	Er II	100	3148.51	Nd II	50	3157.221	Th I	150	3166.26	Zr II
20000	3141.29	Ce III	100 p	3148.68	Ne II	1500	3157.34	Tm II	310	3166.51	Os I
300	3141.33	Ne II	310	3148.71	Tb II	25	3157.54	Rb I	580 c	3166.62	Ho II
60	3141.35	Kr III	180	3148.82	Zr I	320	3157.82	Zr I	380	3167.52	Tb II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
100 s	3167.86	Am II	100	3175.14	Te I	2000	3182.37	Tc I	100	3188.74	Ne II
200	3167.87	Cl IV	80	3175.445	Fe I	50	3182.61	Sr III	150	3188.97	Si II
	3168.	Be I	420	3175.726	Th II	880	3182.86	Zr II	400	3189.02	Po I
140	3168.18	Ir I	50	3175.74	Er III	600	3182.87	Re I	140	3189.05	Rh I
270	3168.24	Pr II	7	3175.78	Mg II	370	3183.03	Mo I	100	3189.11	Kr III
140	3168.32	Tb II	150	3175.78	Nb II	2000	3183.11	Tc I	10000	3189.23	Pu II
700	3168.37	Re I	10	3175.99	Fe III	30	3183.16	Ba I	65	3189.24	W II
450	3168.39	Hf I	100	3175.99	Nd II	3200	3183.41	V I	310	3189.46	Os I
200	3168.52	Ru I	340	3176.21	U II	410	3183.42	Er II	130	3189.62	Hf I
1600	3168.52	Ti II	200	3176.29	Ta I	480	3183.52	Ce II	1700	3189.79	Na II
35	3168.82	Pm I	90 c	3176.30	In II	100	3183.73	Lu II	10	3189.83	Te II
490	3168.88	Ir I	10	3176.50	Pb III	50 c	3183.78	Eu III	240	3189.98	Ru I
6	3168.98	Mg II	320	3176.60	W I	390	3183.84	Ho II	5	3190.07	K II
120	3169.06	Yb II	4000	3176.66	Gd III	140	3183.88	Tb II	220	3190.28	Gd I
290	3169.18	Ce II	450	3176.86	Hf II	720	3183.92	Sm II	200	3190.34	Ce II
110	3169.328	Th II	270 c	3176.97	Ho II	15	3183.96	Ba I	750	3190.68	V II
100	3169.34	Rb III	60	3177.05	Ru II	5300	3183.98	V I	260	3190.78	Re I
230	3169.84	Tb II	340	3177.33	U II	130	3184.05	W I	1000	3190.87	Ti II
360	3169.88	Sm II	10000	3177.55	Cm I	100	3184.37	Ni I	300	3191.10	Nb II
10000	3169.98	Cm II	370	3177.58	Ir I	130	3184.42	W I	470	3191.19	Rh I
1000	3169.99	Dy II	440	3177.71	Re I	270cw	3184.48	Ho II	80	3191.21	Kr III
4	3170.11	I IV	400	3177.89	Dy II	240	3184.55	Ta I	540	3191.21	Zr I
3	3170.14	I III	10	3178.01	Fe III	120	3184.57	Mo I	85	3191.221	Th II
320	3170.29	Ta I	420	3178.06	Os I	1100	3184.76	Re I	70	3191.31	Y I
8700	3170.35	Mo I	10	3178.08	Eu III	200	3184.79	Dy II	800	3191.35	Yb III
10 h	3170.58	Ag I	190	3178.09	Zr II	150	3184.895	Fe I	110	3191.42	Pr II
3000 l	3170.89	Pa II	180	3178.12	Sm II	310	3184.948	Th II	150	3191.43	Nb II
50 c	3171.00	Eu III	220	3178.37	Dy II	370	3185.10	Mo I	900	3191.45	Cl III
2400	3171.36	Lu I	10000 l	3178.47	Bk II	10000	3185.12	Pu II	10 h	3191.46	Eu III
100	3171.45	Zn II	140 h	3178.50	Mn I	16	3185.13	Si III	390	3191.57	W I
3000 l	3171.54	Pa II	260	3178.61	Re I	40	3185.2	Xe III	250	3191.659	Fe I
290	3171.61	Ce II	20 h	3178.87	Eu III	250	3185.25	Er II	30	3191.76	Au I
1000	3171.63	La III	270	3179.048	Th II	230	3185.33	Os I	260	3191.80	Lu II
390dl	3171.72	Ho II	1000	3179.06	Na II	3800	3185.40	V I	210	3191.90	Zr II
1500	3171.74	La III	130	3179.06	W I	15	3185.51	Tl II	3100	3191.99	Ti I
95	3172.03	Mo II	10000	3179.10	Cm I	40	3185.54	Eu I	50	3192.25	Si II
100	3172.23	Zn II	70	3179.33	B II	1100	3185.57	Re I	260	3192.36	Re I
160	3172.31	Pr II	180	3179.33	Ca II	80	3185.59	Rh I	55	3192.585	Th I
10	3172.35	Au II	70	3179.34	Yb III	180	3185.71	Mo I	390	3192.88	Yb II
3	3172.47	Er III	10000	3179.41	Pu II	13	3186.02	Si III	360	3193.01	Sm II
450	3172.65	Tm I	220	3179.41	Y II	180	3186.04	Ru I	150	3193.09	Si II
50	3172.69	La III	70	3179.73	Rh I	240	3186.13	Ce II	500	3193.226	Fe I
6	3172.71	Mg II	1100	3180.193	Th II	250	3186.186	P III	800	3193.299	Fe I
160	3172.74	Mo II	390	3180.29	Nb II	200	3186.37	Ho I	330	3193.30	Dy II
100	3172.77	Pm II	200	3180.30	Tc I	330	3186.38	Dy II	360	3193.53	Hf II
2300	3172.83	Tm II	170	3180.35	Ir I	10000	3186.41	Cm I	10000	3193.54	Pu
890	3172.94	Hf I	5	3180.52	Ca I	2400	3186.45	Ti I	10000	3193.55	Pu II
110	3173.06	Y II	380	3180.54	Tb II	15	3186.56	Tl II	20	3193.81	Be I
3000	3173.30	Tc I	2	3180.64	Co III	50	3186.72	Ge II	10	3193.91	Ba I
1	3173.45	Er III		3180.7	Be II	310	3186.98	Os I	7600	3193.97	Mo I
380	3173.58	Tm II	240	3180.70	Cr II		3187.	Be I	1500	3194.10	Cu I
270	3173.59	Ta I	90	3180.70	Ag II	310	3187.01	Sm II	670	3194.19	Hf II
85	3173.61	Eu II	120	3180.92	Yb II	430	3187.22	Sm II	50	3194.21	Si II
15 h	3173.69	Ba I	80	3180.94	Cs II	480	3187.26	Tb II	310	3194.23	Os I
190	3173.76	Tb II	600	3180.95	Ta I	200	3187.49	Nb I	20 c	3194.34	Eu III
810	3173.78	Ho II	220	3181.01	Hf I	120 d	3187.59	Mo II	200	3194.50	Re I
180	3173.93	Os II	120	3181.15	Hf I	10000	3187.60	Pu II	10000	3194.56	Pu II
400	3174.08	Br III	150	3181.28	Ca II	240	3187.68	Dy II	120	3194.58	Ne II
10	3174.09	Fe III	30	3181.43	Cr II	410	3187.71	V II	50	3194.69	Si II
180	3174.17	F III	810 c	3181.50	Ho II	20	3187.74	He I	190	3194.69	Tb II
10000	3174.49	Pu II	50	3181.54	Nd II	15	3187.74	Tl II	100	3194.72	Au I
220	3174.61	Re I	190	3181.58	Zr II	360	3187.79	Sm II	710	3194.83	Ce II
380	3174.66	Tb II	4	3181.64	I IV	65 h	3188.01	Cr I	1000	3194.98	Nb II
170	3174.76	F III	3	3181.66	I III	290	3188.03	Tb II	25	3195.17	Ba III
390	3174.84	Ho II	55	3181.74	Ni I	10000	3188.11	Cm I	800 c	3195.20	Tc II
550 r	3175.05	Sn I	190	3181.82	W I	770	3188.233	Th II	230	3195.33	Tm II
1000	3175.07	I II	230	3181.88	Os I	240	3188.34	Ru I	100	3195.41	Si II
700	3175.09	P V	870	3181.92	Er II	530	3188.51	V II	55	3195.57	Ni I
700	3175.09	Na II	150	3181.92	Zr II	50	3188.73	Nd II	380	3195.60	Tb II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
2300	3195.62	Y II	780	3202.54	Ti II	320	3210.82	Tm II	15 h	3217.99	Si II
55	3195.689	Th I	170	3202.76	F II	240	3210.97	Mo I	150	3218.19	Ne II
290	3195.96	Mo I	300 c	3202.83	Tc I	180	3210.98	Hf I	260	3218.27	Ti II
200 d	3195.99	Pr II	3	3202.96	He II	85	3211.00	Nd II	50	3218.32	Yb II
12	3196.08	Fe II	15	3203.10	He II	5	3211.21	Te II	200	3218.38	Ce II
360	3196.18	Sm II	100 l	3203.26	Am II	50	3211.67	Fe I	600	3218.61	Sm II
1	3196.26	Li II	2200	3203.32	Y II	600	3211.73	Sm II	40	3218.71	Sn I
300	3196.31	Zn II	120	3203.35	Nb II	35	3211.86	Ge III	1100	3218.93	Tb II
9	3196.33	Li II	110	3203.41	Gd I	100	3211.88	Fe I	710	3218.94	Ce II
4	3196.36	Li II	50	3203.44	Ti II	320	3212.01	Tm II	110	3219.21	Ti I
14	3196.50	Si III	150	3203.47	Nd II	540	3212.01	Zr I	300	3219.307	P III
180	3196.59	Ru I	25 h	3203.70	Ba I	1000	3212.02	Tc II	150	3219.43	Sm II
20	3196.84	La III	240	3203.83	Ti I	610	3212.12	Ir I	190	3219.48	Pr II
200	3196.928	Fe I	100 h	3203.87	Si II	1600	3212.19	Na II	370	3219.51	Ir I
200	3196.93	Hf I	320	3204.04	Pt I	410	3212.43	V I	80	3219.583	Fe I
220	3197.08	Cr II	520	3204.04	P V	1000	3212.81	Eu I	60	3219.766	Fe I
20	3197.10	Be II	3000	3204.16	Pa	220	3212.88	Mn I	1200	3219.98	Tb II
100	3197.10	Zn II	1100 c	3204.25	Re I	110	3213.14	Ti II		3220.	Be I
150	3197.11	Ni I	10000	3204.48	Pu II	13	3213.31	Fe II	10	3220.44	Si II
190	3197.13	Rh I	30	3204.74	Au I	150	3213.31	Os II	600	3220.528	Pb I
30	3197.15	Be II	50	3204.87	Ti I	6	3213.48	I IV	4	3220.60	K II
50	3197.52	Ti II	150	3204.90	Sm II	4	3213.49	I III	180	3220.61	Hf II
40 w	3197.53	Tc I	230	3205.15	Er II	120	3213.74	Ne II	870	3220.73	Er II
25	3197.56	Ge III	330	3205.22	Mo I	420	3213.75	Eu I	40	3220.74	Tc I
2	3197.62	Mg I	50	3205.398	Fe I	10 h	3213.84	Eu III	10000	3220.76	Cm II
390 c	3197.83	Ho II	450	3205.58	V I	200	3213.91	Ta II	5100	3220.78	Ir I
530	3198.01	V I	880	3205.88	Mo I	120	3214.00	F III	10000	3220.94	Pu II
24	3198.11	Cr I	340	3206.05	U II	200	3214.011	Fe I	880	3221.17	Ce II
90 d	3198.11	In II	310	3206.11	Hf I	180	3214.06	Ni I	4	3221.17	Pb IV
1400	3198.12	Lu II	10	3206.30	Eu III	150	3214.12	Sm II	140	3221.21	W I
10000	3198.47	Pu II	300	3206.34	Nb II	760	3214.19	Zr II	100	3221.27	Ni I
220	3198.58	Re I	240	3206.40	Dy II	260	3214.24	Ti I	100	3221.28	Ir I
500	3198.59	Ne II	10000	3206.80	Pu II	70	3214.32	Rh I	560	3221.292	Th II
70	3198.65	Yb II	200	3206.86	Ho II	150	3214.33	Ne II	110	3221.38	Ti I
200	3198.67	Ta I	220	3207.12	Dy II	55	3214.380	Th I	200 c	3221.42	Ho II
390	3198.84	W I	10000	3207.12	Cm II	200	3214.396	Fe I	240	3221.49	Dy II
120	3198.85	Mo I	360	3207.18	Sm II	270	3214.44	Er II	30	3221.63	Ba I
370	3198.92	Ir I	520	3207.25	W I	75	3214.66	Si II	100	3221.64	Ge II
110	3199.04	Pr II	450	3207.41	V I	190	3214.75	Ti II	150	3221.65	Ni I
200	3199.28	Ce II	10000	3207.71	Cm I	400	3214.95	Er III	350	3221.74	Mo I
220	3199.30	Gd I	100	3207.89	Pr II	25	3214.95	Ge III	1	3221.86	Au I
5	3199.33	Li II	10000	3207.97	Pu II	560	3215.07	Mo I	140	3221.91	W I
2	3199.43	Li II	180	3208.17	Sm II	10000	3215.08	Pu I	35	3222.04	Pm I
80	3199.500	Fe I	500	3208.20	Al IV	8	3215.17	Ca I	300	3222.045	Fe I
200	3199.51	Si II	400	3208.20	Hg II	470	3215.19	Dy II	40	3222.19	Ba I
480	3199.56	Tb II	1400	3208.23	Cu I	270	3215.26	Sm II	110	3222.47	Zr II
160	3199.58	Gd I	140	3208.28	W I	6	3215.34	Ca I	200	3222.60	Rb III
3800	3199.92	Ti I	30	3208.59	Cr II	1000	3215.56	W I	50	3222.62	Nd I
130	3199.99	Hf II	20	3208.60	Be I	390	3215.60	Nb II	1300	3222.84	Ti II
10000	3200.23	Pu II	3000	3208.83	Mo I	15 h	3215.67	Ag I	20	3223.01	Si II
2200	3200.27	Y II	290	3208.85	Dy II	60	3215.938	Fe I	30	3223.168	Th I
8	3200.37	Ar I	10	3208.95	Eu III	10000	3216.15	Pu II	180	3223.27	Ru I
30	3200.37	Au I	60	3208.96	Ne II	7	3216.25	Si III	290	3223.28	Dy II
60	3200.47	Fe I	170	3209.18	Cr II	50	3216.27	Yb III	610	3223.31	Er II
310	3200.58	Er II	6	3209.34	K III	830	3216.63	Dy II	220	3223.52	Ti I
50	3200.62	Nd II	120	3209.36	Ne II	3900	3216.69	Y II	690	3223.74	Gd II
120	3200.71	Pt I	160	3209.66	O IV	530	3216.85	Sm II		3223.78	Gd I
10000	3201.00	Pu II	10000	3209.89	Cm II	65	3216.95	Mn I	300	3223.83	Ta I
240	3201.16	Yb II	10000	3209.94	Cm I	1100	3217.06	Ti II	10000	3224.23	Cm I
40	3201.50	Mo II	7	3209.96	Ca I	210	3217.11	V II	240	3224.24	Ti II
10000	3201.66	Pu II	200 h	3210.03	Si II	100	3217.12	Nd II	20 l	3224.7	Ac IV
990	3201.71	Ce II	10000	3210.05	Cm II	7	3217.16	K I	120	3224.82	Ne II
390	3201.76	Ho II	4	3210.12	I IV	80	3217.18	Yb II	10000	3224.87	Pu II
150	3201.80	Sm II	3	3210.14	I III	180	3217.30	Hf II	6	3224.90	I IV
6	3201.95	K III	170	3210.308	Th II	50	3217.377	Fe I	4	3224.93	I III
55	3202.14	Ni I	270 c	3210.41	Ho II	140	3217.40	Cr II	6	3224.99	Kr IV
750	3202.38	V I	15	3210.55	Si III	6	3217.62	K I	210	3225.02	Ni I
20	3202.49	Si II	320	3210.56	Tm II	180	3217.83	Ni I	240	3225.08	Dy II
30	3202.520	Th I	420	3210.57	Eu I	110	3217.94	Ti I	10000	3225.11	Cm I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
10	3225.15	Ag I	630	3231.69	Zr II	330	3237.98	Er II	490	3245.12	Dy II
30	3225.25	Au I	10000	3231.86	Pu II	590	3238.116	Th II	510	3245.13	La II
110	3225.46	Gd II	150	3231.95	Sm II	220	3238.53	Ru I	10000	3245.25	Pu II
800	3225.48	Nb II	120	3232.02	Ne II	10000	3238.55	Cm II	100	3245.48	Pr II
330	3225.67	Ce II	250	3232.03	Er II	35	3238.55	Pm I	120	3245.54	Cr I
600	3225.78	Fe I	1900	3232.06	Os I	80	3238.57	O III	300	3245.69	Kr III
50	3225.88	Yb II	20	3232.11	Co III	290	3238.63	Os I	10000	3245.71	Pu
9	3225.90	Ca I	680	3232.16	U II	100	3239.	Bi IV	80	3246.005	Fe I
330	3225.95	Dy II	10000	3232.24	Pu	4100	3239.04	Ti II	45	3246.03	Eu I
140	3226.13	Ti I	240	3232.28	Ti II	45	3239.20	Yb II	35	3246.06	Yb II
6	3226.15	Ca I	150	3232.37	Ne II	100	3239.433	Fe I	10000	3246.25	Cm I
160	3226.32	Gd II	190	3232.49	W I	130	3239.44	Hf I	10000	3246.35	Pu II
110	3226.37	Ru I	600 r	3232.52	Sb I	40	3239.52	Kr III	200	3246.67	Ce II
10000	3226.41	Cm II	10000	3232.63	Pu II	35	3239.58	Yb I	320	3246.96	Tm I
270	3226.84	Sm II	17	3232.66	Li I	210 d	3239.60	Tb II	10000 s	3247.26	Bk II
710	3227.11	Ce II	220	3232.78	Gd I	60	3239.62	Pm II	45	3247.32	Eu II
210	3227.16	Er II	1100	3232.96	Ni I	720	3239.66	Sm II	420	3247.46	Tm II
13	3227.73	Fe II	80	3233.05	Fe I	220	3239.66	Ti II	200	3247.47	Nb II
80	3227.796	Fe I	1100	3233.14	Mo I	10000	3239.72	Bk I	10000	3247.50	Pu
100	3227.88	Ru I	15	3233.18	Ag I	250	3240.00	Tb II	10000 r	3247.54	Cu I
50	3227.98	Rb I	320	3233.34	Ho II	400	3240.186	Pb I	100	3247.55	Eu I
100	3227.99	Au III	20	3233.42	Pt I	1600	3240.23	Tm II	10000	3247.56	Pu II
50	3228.04	Nd II	2	3233.52	Be II	600	3240.24	Po I	360	3247.66	Hf I
1000	3228.09	Mn I	150	3233.536	P III	40	3240.44	Kr III	120	3248.00	Os I
880	3228.22	Mo I	400	3233.602	P III	3000 l	3240.58	Pa II	100	3248.34	Ne II
180	3228.50	Sm II	430	3233.68	Sm II	65	3240.71	Mo II	200	3248.36	Dy II
220	3228.53	Ru I	14	3233.95	Si III	190	3241.04	Os I	50 w	3248.39	Pr III
20000	3228.57	Ce III	50	3233.967	Fe I	760	3241.05	Zr II	100	3248.46	Ni I
2000	3228.58	Yb III	28	3234.06	Cr II	240	3241.108	Th II	650	3248.52	Mn I
530	3228.60	Ti II	630	3234.12	Zr I	530	3241.16	Sm II	1200	3248.60	Ti II
270	3228.78	Sm II	710	3234.16	Ce II	120	3241.24	Ru I	120	3248.94	Nb II
200	3228.81	Zr II	70	3234.2	S III	20	3241.28	Sb II	2	3249.24	Co III
560	3229.009	Th II	3000	3234.20	Ce III	10000	3241.39	Pu II	330	3249.34	Er II
6	3229.16	Rb I	100	3234.27	Pr II	95	3241.40	Eu I	260	3249.35	La II
780	3229.19	Ti II	6600	3234.52	Ti II	470	3241.52	Ir I	160	3249.52	Nb I
30	3229.20	Cr I	120	3234.613	Fe I	2300	3241.54	Tm II	220	3249.53	Hf I
230	3229.24	Ta I	60	3234.62	Nd	180	3241.59	Sm II	240	3249.75	Sm II
300	3229.28	Ir I	290	3234.65	Ni I	10	3241.62	Be II		3249.87	Li II
240	3229.36	Ce II	330	3234.89	Ce II	15	3241.62	Si III	100	3250.19	Gd II
530	3229.42	Ti II	700	3234.93	Na II	30	3241.83	Be II	150	3250.33	Cd II
730	3229.50	U II	25	3235.04	Ba III	100	3241.84	Tc I	100	3250.36	Ne II
140	3229.56	Nb II	45	3235.13	Eu I	2600	3241.99	Ti II	20	3250.36	Pt I
120	3229.57	Ne II	100	3235.39	Sr III	140	3242.03	W I	720	3250.37	Sm II
100	3229.613	Pb I	470	3235.44	Tm II	180	3242.04	Sm II	320	3250.39	Zr I
60	3229.63	Be I	480	3235.84	Th II	200	3242.05	Ta I	120	3250.74	Ni I
1200	3229.75	Tl I	490	3235.89	Dy II	6200	3242.28	Y II	100	3251.14	Mn I
600	3229.79	Mo I	380	3235.94	Re I	10000	3242.66	Cm II	1200	3251.27	Dy II
60	3230.02	Tc I	220	3236.12	Ti II	11000	3242.70	Pd I	990	3251.32	Sc II
250	3230.03	Tb II	300	3236.222	Fe I	200	3242.83	Ta I	2700	3251.64	Pd I
130	3230.06	Hf I	400	3236.40	Nb II	5	3242.84	Pb III	130	3251.84	Cr I
200	3230.07	Ne II	5200	3236.57	Ti II	100	3242.86	Xe III	950	3251.91	Ti II
10000	3230.28	Cm I	110	3236.58	Zr II	10000	3242.96	Pu II	280	3251.915	Th II
30	3230.29	Pt I	720	3236.64	Sm II	600	3243.06	Ni I	40	3251.98	Pt I
10000	3230.35	Cm II	290	3236.69	Dy II	1500 h	3243.16	Cu I	300	3252.05	Tc I
20	3230.42	Fe II	390	3236.74	Ce II	130	3243.35	Hf I	10000	3252.08	Pu I
120	3230.42	Ne II	10000	3236.74	Cm I	390	3243.37	Ce II	10000	3252.19	Bk I
12	3230.50	Si III	850	3236.78	Mn I	100	3243.40	Ne II	200	3252.19	Dy II
720	3230.56	Sm II	1200	3236.81	Tm II	10000	3243.40	Pu II	140	3252.29	W I
2300	3230.58	Er II	200	3236.90	Ho II	120	3243.50	Ru I	480	3252.32	Tb II
300 s	3230.59	Ac II	1000	3237.02	Tc II	20	3243.689	Ar II	300	3252.524	Cd I
300	3230.63	Au I	950	3237.08	Mo I	330	3243.78	Mn I	10000	3252.68	Cm I
300	3230.72	Mn I	140	3237.09	W I	100	3244.10	Ne II	1200	3252.91	Ti II
100	3230.76	Ir I	200	3237.40	Ho II	10000	3244.16	Pu I	310	3252.95	Mn I
110	3230.868	Th II	80	3237.66	Rh I	80	3244.187	Fe I	360	3253.40	Sm II
250	3231.06	Tb II	150 s	3237.70	Ac II	1 h	3244.19	Si IV	7	3253.40	Si III
480	3231.24	Ce II	65	3237.73	Cr I	500	3244.19	Tc I	400	3253.53	Gd III
110	3231.32	Ti II	150	3237.87	V II	440	3244.22	U II	890	3253.70	Hf II
230	3231.51	Tm II	150	3237.89	Sm II	110	3244.448	Th I	5	3253.74	Si III
360	3231.53	Sm II	40	3237.91	Nd II	150	3244.69	Sm II	10	3253.94	Au I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
270	3253.94	Sm II	3100	3262.29	Os I	100	3268.48	Kr III	750	3276.12	V II
65	3254.04	Mn I	60 r	3262.34	Ba I	30	3268.77	Te II	10	3276.26	Si III
320	3254.07	Nb II	550 r	3262.34	Sn I	300	3268.89	Re I	430	3276.75	Sm II
100	3254.08	Nd II	200	3262.355	Pb I	80	3268.98	Xe III	25 l	3276.80	Y III
1200	3254.25	Ti II	120	3262.47	Hf I	790	3268.99	Tm II	1100	3276.81	Tm II
200	3254.28	Zr I	300	3262.63	Mo I	15	3269.02	Be I	200	3277.26	Tm III
4800	3254.31	Lu II	910	3262.668	Th II	240	3269.11	Dy II	160	3277.28	Ir I
60	3254.36	Fe I	380	3262.75	Os I	620	3269.21	Os I	210	3277.32	Tb II
210	3254.36	W I	250	3262.97	Tb II	2	3269.23	Co III	100	3277.57	Ru I
850	3254.38	Sm II	520	3263.14	Rh I	330	3269.41	Er II	160	3277.67	Nb I
80	3254.70	Mo III	140	3263.24	V I	110	3269.489	Ge I	220	3277.69	O II
140	3254.77	V II	160	3263.37	Nb II	190	3269.66	Zr I	210	3277.78	Eu II
7	3254.80	Si III	10000 s	3263.47	Bk II	4400	3269.91	Sc I	330	3277.97	Os I
190	3254.91	Os I	230 d	3263.87	Tb II	440	3270.12	U II	390 c	3278.15	Ho II
40	3255.05	Ge III	200	3263.88	Ce II	6	3270.46	Si III	250	3278.22	Er II
270	3255.28	Hf II	400	3264.06	Hg II	120	3270.47	Nb I	200	3278.29	Ti II
110	3255.63	Sm II	140	3264.08	F II	180	3270.49	Sm II	30	3278.733	Th I
1500	3255.69	Sc I	320	3264.10	Tm II	180	3270.68	Sm II	6	3278.79	K III
160	3255.92	Pt I	480	3264.40	Mo I	100	3270.76	Nb I	40	3278.86	Zr III
13000	3256.09	In I	120 d	3264.55	Ru I	800	3270.90	Mo I	260	3278.92	Ti II
40	3256.10	Tc I	160	3264.59	Nb I	220	3270.98	O II	3800	3278.97	Lu I
310	3256.14	Mn I	180	3264.71	Mn I	2000	3270.99	Rb II	270	3279.25	Ho II
950	3256.21	Mo I	2700	3264.78	Er II	50	3271.000	Fe I	7	3279.26	Si III
290	3256.26	Dy II	150	3264.81	Kr III	100	3271.12	Ni I	1300	3279.26	Zr II
910	3256.274	Th II	230	3264.90	Tb II	900	3271.12	V II	720	3279.33	Er II
60	3256.80	Te II	430	3264.94	Sm II	150	3271.13	Zr II	110	3279.53	Gd II
50	3256.91	Nd II	80	3265.046	Fe I	520	3271.61	Rh I	200 h	3279.67	Hf III
190	3256.92	Os I	10 h	3265.10	Au I	500	3271.63	Cs II	200	3279.84	Ce II
180	3257.366	Th I	220	3265.12	Nd II	10	3271.63	Au I	110	3279.84	V II
200 c	3257.45	Ho II	10000	3265.17	Pu	30	3271.65	Kr III	270	3279.98	Hf II
130	3257.82	Cr I	50	3265.38	Nd II	310	3271.65	Ti II	890	3280.09	Dy II
1500	3257.96	Na II	300	3265.46	O III	200	3271.69	Mo III	720	3280.22	Er II
1900	3258.05	Tm II	50	3265.617	Fe I	110	3272.027	Th I	50	3280.26	Fe I
220	3258.41	Mn I	550	3265.67	La II	200	3272.07	Nb I	760	3280.31	Tb II
3000	3258.56	In I	340	3265.79	U II	310	3272.08	Ti II	10000	3280.45	Cm I
12	3258.66	Si III	10000	3265.81	Cm I	190	3272.16	Os I	2300	3280.55	Rh I
3500	3258.78	Pd I	800	3265.92	Cs II	540	3272.22	Zr II	55000 r	3280.68	Ag I
600	3258.85	Re I	60	3266.11	Nb III	990	3272.25	Ce II	270	3280.84	Sm II
560	3259.05	Er II	200	3266.21	Dy II	430 d	3272.48	Sm II	310	3280.91	Y II
	3259.11	Er II	100	3266.39	Eu II		3272.60	Sm II	90 s	3280.92	Pr III
220	3259.24	Nd II	400	3266.40	Tb II	200	3272.73	Dy II	50	3281.048	Th I
110	3259.25	Gd II	390	3266.44	Ir I	150	3272.77	Eu II	760	3281.40	Tb II
140	3259.43	W I	120	3266.44	Ru I	430	3272.81	Sm II	50	3281.49	Nd II
600	3259.55	Re I	9	3266.52	Sr IV	1000	3273.05	Zr II	40	3281.50	Ba I
210	3259.66	W I	210 d	3266.62	W I	200	3273.08	Ru I	100	3281.61	Gd II
20	3259.68	Co III	1600	3266.64	Tm II	10000	3273.11	Pu II	25	3281.65	Ba III
20	3259.90	Ge III	540	3266.73	Gd I	100	3273.18	Nd II	110	3281.70	Rh I
95	3259.98	Cr I		3266.77	W I	10	3273.47	Au I	7600	3281.74	Lu I
200	3260.11	Zr I	13	3266.88	Fe III	430	3273.48	Sm II	15	3281.77	Ba I
650	3260.21	Na II	180	3267.003	Th II	220	3273.52	O II	150	3281.94	W I
180	3260.23	Mn I	30 h	3267.07	Au I	5500	3273.63	Sc I	980 c	3281.97	Ho II
190	3260.30	Os I	430	3267.10	Er II	180	3273.66	Hf II	25	3281.97	Pt I
280	3260.35	Ru I	3	3267.10	Y III	10000 r	3273.96	Cu I	250	3282.25	Gd I
10000	3260.54	Pu II	800	3267.13	Cs II	250	3274.14	Tb II		3282.30	Gd II
230	3260.56	Nb II		3267.18	Er II	110	3274.18	Gd II	500 s	3282.32	Am II
100	3260.66	Nd II	500	3267.21	Al IV	950	3274.22	Na II	220	3282.33	Ti II
500	3260.91	Ac II	170	3267.25	Nd II	250	3274.33	Tb II	500 r	3282.33	Zn I
200	3260.98	Ce II	80	3267.31	O III	3000	3274.46	Pa II	30	3282.63	Te II
200	3260.98	O III	100	3267.35	Ag II	100	3274.58	Be II	120	3282.70	Ni I
300	3261.055	Cd I	1200	3267.40	Tm II	30	3274.67	Be II	1400 h	3282.72	Cu I
130	3261.51	Yb II	700 r	3267.51	Sb I	5	3274.67	Ca I	320 d	3282.73	Zr I
200	3261.56	Re I	250	3267.64	Gd I	10000	3274.71	Pu II	490	3282.77	Dy II
1200	3261.60	Ti II	1100	3267.70	V II	200	3274.71	Ru I	50	3282.78	Nd II
400	3261.65	Tm II	4000	3267.76	Ce III	330	3274.86	Ce II	30	3282.91	Be I
3	3261.70	Kr IV	3000	3267.94	Ce III	210	3274.95	Ta II	5	3283.02	Hg III
40	3261.94	Tc I	3100	3267.94	Os I	530	3275.20	Os I	520	3283.10	Tb II
50	3261.96	Ba I	200	3268.21	Ru I	320	3275.22	Nd II	50	3283.21	Sn II
200	3262.01	Ir I	140	3268.34	Gd II	10000	3275.24	Pu I	1200	3283.40	Tm II
360	3262.28	Sm II	25	3268.42	Pt I	11	3276.08	Fe III	200	3283.46	Nb II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
2300	3283.57	Rh I	430	3291.48	Gd I	80 w	3301.55	Xe III	24	3307.02	Cr II
50	3284.56	V IV	310	3291.56	Tb II	7600	3301.56	Os I	850	3307.02	Sm II
880	3284.71	Zr II	910	3291.739	Th II	370	3301.59	Ru I	320	3307.12	Mo I
240	3285.02	Mo I	160	3292.02	Nb II	280	3301.60	Re I	20	3307.228	Ar II
1000	3285.04	Tb II	290	3292.08	Ti I	240	3301.650	Th I	420 d	3307.44	Tb II
290	3285.10	Nd II	370	3292.21	Gd II	340	3301.68	Sm II	10000	3307.66	Pu II
600	3285.13	Al IV	190	3292.31	Mo II	300	3301.73	Sr I	2500 h	3307.95	Cu I
330	3285.22	Ce II	620	3292.520	Th II	10000	3301.76	Pu I	210	3308.01	Tm II
320	3285.36	Mo I	10000	3292.56	Pu I	500	3301.86	Pt I	10	3308.02	Ca II
1700	3285.60	Na II	90 l	3292.58	Pr III	20	3301.88	Ar III	140	3308.02	Eu II
1200	3285.61	Tm II	400	3292.87	Ni II	150	3301.95	Eu II	120	3308.05	Nb I
230	3285.66	Nb I	1500	3293.07	Tb II	3600	3302.13	Pd I	300	3308.30	Au I
180	3285.66	Sm II	240	3293.37	Sm II	240	3302.23	Re I	220	3308.39	Ti I
130	3285.752	Th I	30	3293.55	In III	10000 s	3302.35	Bk II	19	3308.47	Y II
25	3285.85	Ar III	10000	3293.61	Pu I	19	3302.37	Na I	210	3308.51	Tb II
140	3285.88	Zr II	25	3293.640	Ar II	2000	3302.46	Tm II	10000	3308.75	Pu I
30	3285.89	Kr III	150	3293.71	W I	800	3302.58	Zn I	440	3308.79	Dy II
6	3286.07	Ca I	70	3293.84	Nd II	30	3302.72	Sr III	220	3308.81	Ti II
430	3286.23	Sm II	200	3293.88	Dy II	700 r	3302.94	Zn I	1100	3308.88	Dy II
250	3286.38	Po I	430	3294.08	Gd I	18	3302.98	Na I	150	3308.92	P II
500	3286.41	Rb III	490	3294.11	Ru I	800	3303.11	La II	120	3309.19	Hf I
100	3286.62	Nd II	210	3294.28	Rh I	320	3303.21	Re II	130	3309.365	Th I
200 l	3286.67	Am II	70	3294.68	Nd II	280	3303.75	Re I	260	3309.50	Ti I
150	3286.75	Fe I	200	3294.83	Re I	330 d	3303.88	Er II	340	3309.52	Sm II
470	3286.77	Er II	240	3295.28	Ce II		3303.95	Er II	300	3309.64	Au I
20	3286.79	Ba III	210	3295.33	Tb II	480	3304.238	Th I	60	3309.73	Ti I
100	3287.14	Tc I	30	3295.43	Cr II	45	3304.50	Eu II	150	3309.74	Ne II
460	3287.25	Pd I	360	3295.44	Sm II	340	3304.52	Sm II	1200	3309.80	Tm II
100	3287.49	Mn III	430	3295.81	Sm II	30	3304.75	Kr III	100	3309.86	Au III
310	3287.55	Tb II	320	3296.01	Nb I	120	3304.83	Nb I	340	3310.27	Hf I
100	3287.59	Ir I	90 s	3296.10	Pr III	240	3304.84	Ce II	120	3310.47	Nb I
200	3287.59	Nb I	200	3296.30	Dy II	10000	3304.85	Cm I	160	3310.52	Ir I
360	3287.59	O II	75	3296.63	Pm I	210	3304.95	Tb II	640	3310.59	Tm II
530	3287.66	Ti II	280	3296.70	Re I	1500	3304.96	Na II	200	3310.65	Tc I
10	3287.68	Co III	10000	3296.71	Cm II	160	3305.15	O II	850	3310.66	Sm II
620	3287.789	Th II	45	3296.72	Rh I	540	3305.15	Zr II	50	3310.69	Rh III
30	3287.82	Xe III	200	3296.88	Ce II	200 c	3305.16	Ho II	620	3310.91	Os I
160	3287.92	Nb I	65	3296.88	Mn I	340	3305.18	Sm II	1100	3311.16	Ta I
200	3287.94	Dy II	10000	3296.91	Pu I	9	3305.22	Fe III	15	3311.25	Ar III
440	3288.21	U II	280	3296.99	Re I	130	3305.25	Yb I	440	3311.38	W I
390	3288.46	Ho II	500	3297.60	Ni II	15	3305.38	Co III	50	3311.47	Kr III
10000 l	3288.75	Bk I	150	3297.73	Ne II	200	3305.40	Dy II	60	3311.76	Pm II
150	3288.80	Zr II	240	3297.832	Th II	200	3305.51	Dy II	6200	3312.11	Lu I
10	3288.81	Fe III	10000	3297.87	Pu I	370	3305.56	Er II	200	3312.22	Ce II
190	3288.84	Os I	720	3298.10	Sm II	320	3305.56	Mo I	12	3312.28	Hg III
1100	3289.02	Mo I	10000	3298.14	Cf	10 h	3305.67	Ag I	80	3312.30	O III
6	3289.06	K III	140	3298.14	V I	400	3305.71	Ni II	2300	3312.42	Er II
70	3289.11	La III	65	3298.22	Mn I	140	3305.73	Yb II	600	3312.42	Sm II
280	3289.14	Rh I	10000	3298.47	Pu II	80	3305.89	Tc I	50	3312.56	Ge II
10000	3289.35	Bk I	70	3298.61	Nd	1100	3305.89	U II	400	3312.60	Nb I
18000	3289.37	Yb II	310	3298.66	Tb II	120	3305.97	Fe I	10000	3312.65	Pu II
50	3289.52	Nd	30	3298.84	Tc II	210	3306.01	Tm II	110	3312.69	Ti I
45	3289.64	Rh I	12	3299.05	Mg III	75	3306.01	Zn II	510	3312.72	Dy II
700	3289.80	Cl III	170	3299.41	Ti I	210	3306.12	Hf I	200	3312.75	Nd II
120	3290.22	Pt I	50	3299.42	Zn II	100 l	3306.14	Pr III	670	3312.86	Hf I
1200	3290.26	Os I	160	3299.61	Nb I	220	3306.17	Ru I	140	3313.33	Eu II
720 d	3290.28	Sm II	220	3300.15	Ce II	240	3306.19	Dy II	50	3313.38	Pm I
	3290.39	Sm II	300	3300.16	Nd II	250	3306.23	Os I	100	3313.62	Mo II
400	3290.418	Cu II	260	3300.46	Rh I		3306.28	Li II	150	3313.65	Tc I
1500 h	3290.54	Cu I	2	3300.47	I III	880	3306.28	Zr II	150	3313.70	Zr II
100	3290.65	Nd II	100	3300.77	Tc I	200	3306.343	Fe I	330	3313.73	Gd II
5	3290.65	K II	3	3300.80	Tl III	13	3306.39	Mg III	240	3313.95	Re I
180	3290.65	Sm II	730	3300.82	W I	1700	3306.39	Sm II	210	3314.38	Tb II
950	3290.82	Mo I	110	3300.881	Cu II	10000	3306.59	Pu I	840	3314.42	Ti I
270 c	3290.96	Ho II	170	3300.98	Sm II	160	3306.60	O II	210	3314.50	Zr II
2300	3291.00	Tm II	250	3301.229	Cu II	170	3306.61	Sm II		3314.52	Ti I
15	3291.01	Tl II	2000	3301.23	Er III	10000	3306.66	Pu I	240	3314.72	Ce II
160	3291.05	Hf I	1700	3301.35	Na II	170	3306.88	Ti I	50	3314.790	Th I
730	3291.33	U II	15	3301.48	La III	210	3306.91	Tm II	60	3315.05	Pt I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
50	3315.10	Yb II	2900	3322.94	Ti II	110	3330.62	Sn I	190	3338.41	Zr II
200	3315.22	Nb I	380	3322.99	Zr II	70	3330.67	Mn I	90 c	3338.50	In II
290	3315.23	Ru I	4200	3323.09	Rh I	60	3330.76	Kr III	330	3338.54	Rh I
290	3315.32	Ti II	40	3323.11	Te II	100	3330.77	Tc I	150	3338.648	Cu II
10000	3315.34	Pu II	110	3323.18	B II	200	3330.78	Mn II	45	3338.75	Eu II
120	3315.42	Os I	770	3323.19	Er II	330 d	3330.99	Ta II	390 c	3338.86	Ho II
1900	3315.43	Cl II	210	3323.38	Tb II	60	3331.09	Rh I	10000	3338.94	Pu I
200	3315.59	Gd II	10000	3323.48	Pu	45	3331.24	Rh I	250	3339.00	Tb II
660	3315.66	Ni I	7	3323.59	Ar III	1400	3331.38	Gd II	290	3339.07	Nd II
200	3316.276	Cu II	110	3323.60	B II	10000	3331.52	Pu II	9	3339.39	Fe III
780	3316.32	Dy II	75	3323.64	Ge II	200	3331.52	Re I	930	3339.55	Ru I
560	3316.39	Er II	1000	3323.74	Ne II	250	3331.57	Nd II	130	3339.80	Cr II
290	3316.39	Ru I	340	3323.77	Sm II	75	3331.57	Pm I	500	3339.82	Si II
20	3316.51	Ca II	35	3323.80	Pt I	40	3331.6	Xe III	250	3340.03	Er II
410	3316.58	Sm II	210	3323.89	Tb II	440	3331.69	W I	240	3340.17	Mo I
400	3316.88	Tm II	640	3323.95	Mo I	2000	3331.88	Ni II	1100	3340.34	Ti II
10000	3316.96	Pu II	55	3324.06	Cr II	200	3331.93	Ho II	55	3340.38	Y I
240	3317.12	Dy II	250	3324.33	Os I	550	3332.11	Ti II	900	3340.42	Cl III
10000	3317.14	Cm I	3800	3324.40	Tb II	830	3332.13	Gd II	1200	3340.55	Rb II
200	3317.80	Ce II	390	3324.752	Th II	6	3332.15	Mg I	760	3340.56	Zr II
210	3317.93	Ta I	70	3324.9	S III	110	3332.16	Nb I	90 s	3340.58	Pr III
180	3317.99	Hf II	100	3325.00	Ru I	10000	3332.34	Pu I	850	3340.58	Sm II
100 s	3318.01	Ac II	840	3325.120	Th II	50	3332.47	Tc I	110	3340.74	O III
330	3318.02	Ti II	340	3325.26	Sm II	3000 l	3332.69	Pa II	780	3341.00	Dy II
1000	3318.04	Na II	170	3325.48	Sm II	770	3332.70	Er II	8	3341.00	Er III
30	3318.390	Th I	2000	3325.51	Yb III	890	3332.73	Hf I	500 s	3341.43	Pr III
210	3318.65	Tm II	200	3325.55	Tc I	10000	3333.03	Pu	80	3341.48	Hg I
680	3318.84	Ta I	360	3325.67	Mo I	50	3333.06	Yb II	80	3341.481	Hg I
200	3318.98	Nb I	200	3325.75	Kr III	450	3333.07	Br III	130	3341.60	Nb II
150	3319.02	Zr II	200	3325.90	Nd II	300	3333.14	Si II	240	3341.66	Ru I
120	3319.26	Nb I	270	3326.19	Dy II	60 s	3333.26	Pr III	440	3341.66	U II
7	3319.34	Ar I	440	3326.20	W I	170	3333.64	Sm II	70 s	3341.68	Pr III
80	3319.41	Yb I	28	3326.59	Cr I	130	3334.16	Ir I	290	3341.84	Er II
120	3319.58	Nb II	240	3326.62	Nb I	380	3334.25	Zr II	240	3341.87	Ce II
300	3319.72	Ne II	380	3326.76	Ti II	950	3334.33	Eu I	270	3341.88	Dy II
200	3319.87	Ho II	380	3326.80	Zr II	200	3334.46	Ce II	5700	3341.88	Ti I
1000	3319.88	Dy II	150 c	3327.10	Tc I	290	3334.48	Nd II	1300	3341.97	Nb I
65	3319.89	Eu II	150	3327.15	Ne II	210	3334.48	Tb II	30	3342.073	Th II
12	3319.91	Tl II	10000	3327.19	Pu I	620	3334.604	Th II	120	3342.15	Ti I
100	3320.12	Au I	360	3327.30	Mo I	210	3334.62	Zr II	1600	3342.24	Re I
430	3320.16	Sm II	310	3327.42	Os I	60	3334.79	V IV	50	3342.48	Kr III
230	3320.25	Ho II	35	3327.66	La III	200	3334.84	Ne II	11	3342.58	Mg III
330	3320.26	Ni I	950	3327.69	Na II	1800	3335.20	Ti II	110	3342.59	Cr II
700	3320.57	Cl III	340	3327.88	Sm II	10000	3335.26	Bk I	70	3342.90	Rh I
110	3320.59	Sm II	4700	3327.89	Y II	400	3335.64	Ni II	280 d	3342.93	Yb II
10000	3320.61	Pu I	130	3328.21	Hf II	120	3335.69	Ru I		3343.07	Yb II
65	3320.69	Mn I	55	3328.255	Th II	12	3335.90	Mg III	50	3343.21	Cd II
10000	3320.84	Pu I	410	3328.28	Nd II	170	3336.12	Sm II	110 d	3343.28	Sc II
190	3320.90	Mo II	30	3328.35	Cr II	25	3336.13	Ar III	30	3343.34	Cr I
30	3321.01	Be I	600	3328.60	Po I	960	3336.15	Os I	240	3343.49	Sm II
12	3321.04	Tl II	30	3329.05	Cr I	1100	3336.18	Gd II	980 c	3343.58	Ho II
300	3321.08	Br III	800	3329.06	Cl III	95	3336.33	Cr II	110	3343.64	Sm II
30	3321.09	Be I	520	3329.08	Tb II	100	3336.39	Mn II	1300	3343.71	Nb I
340 d	3321.15	Tb II	1200	3329.10	Cl II	20	3336.61	Sb III	260	3343.77	Ti II
1200	3321.18	Sm II	100	3329.16	Ne II	9	3336.68	Mg I	330	3343.86	Ce II
220	3321.34	Be I	50	3329.22	Pm I	250	3336.70	Tb II	100 l	3343.87	Am I
510	3321.450	Th II	60	3329.22	Te II	240	3337.17	Yb II	80	3344.20	Rh I
1500	3321.49	Rb II	170	3329.36	Nb I	630 c	3337.23	Ho II	810	3344.32	Re I
550	3321.70	Ti II	100	3329.43	Cs II	370	3337.25	Er II	240	3344.35	Sm II
95	3321.86	Eu II	2100	3329.46	Ti II	1500	3337.49	La II	150	3344.40	Ne II
40	3321.92	Te II	290	3329.66	Er II	10000	3337.71	Pu II	400	3344.46	Al IV
8	3322.25	Tl II	110	3329.86	V I	290	3337.79	Er II	200	3344.47	Ho II
85	3322.26	Eu I	17	3329.93	Mg I	390	3337.79	U II	10	3344.51	Ca I
420	3322.28	Tb II	300	3329.99	Sr I	1500	3337.84	Cu I	870	3344.56	La II
310	3322.31	Ni I	10000	3330.11	Pu	620	3337.870	Th II	20	3344.72	Ar III
6	3322.40	K III	100	3330.16	Rb III	310	3338.03	Tb II	1300	3344.75	Mo I
600	3322.48	Re I	430	3330.34	Gd II	500	3338.09	Ni II	440	3344.76	Ce II
200	3322.60	Ir I	400	3330.34	Gd III	2000	3338.18	Re I	380	3344.79	Zr II
50	3322.80	Ba I	250	3330.476	Th I	10000	3338.40	Pu II	800	3345.02	Zn I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
6	3345.32	K II	30	3351.60	Cr I	100	3358.14	Pm II	100 l	3364.52	Pr III
70 s	3345.38	Pr III	110	3351.74	Os I	50	3358.25	Yb III	50	3364.88	Pr III
20	3345.43	Be I	10000	3351.82	Pu II	290	3358.28	Ti I	760	3364.93	Tb II
70 l	3345.44	Pr III	100	3351.93	Kr III	10000	3358.41	Pu II	270	3364.96	Nd II
300	3345.45	Ne II	55	3351.97	Cr I	1700	3358.42	Nb I	30	3365.02	Mn II
500	3345.57	Zn I	60	3351.97	Sn II	270	3358.43	Gd II	10000	3365.20	Pu I
150	3345.83	Ne II	270	3352.05	Sc II	230	3358.47	Ta I	110	3365.55	V I
150	3345.94	Zn I	370	3352.06	Hf II	15	3358.49	Ar III	130	3365.58	Nb II
590	3345.98	Gd II	320	3352.10	Ho II	170	3358.50	Cr II	200	3365.59	Gd II
95	3346.02	Cr I	60	3352.10	Te II	620	3358.602	Th II	200	3365.648	Cu II
1300	3346.04	Er II	100	3352.49	Yb II	4300	3358.62	Gd II	10000	3365.66	Pu
320	3346.20	Re I	270	3352.69	Dy II	600	3358.68	Ni II	330	3365.77	Ni I
95	3346.40	Mo II	10000	3352.71	Cf	10000	3358.84	Pu II	50 s	3365.80	Pr III
80	3346.50	Yb	20	3352.79	Co II	230	3358.91	Hf I	1200	3365.86	Sm II
180	3346.557	Th II	120	3352.94	Ti I	500 l	3359.41	Pr III	300	3366.03	Pm I
3000 s	3346.66	Pa II	55 h	3353.03	Cr I	240	3359.46	Dy II	330	3366.17	Ni I
330	3346.73	Ti II		3353.13	Cr II	7600	3359.56	Lu I	300	3366.33	Sr I
95	3346.74	Cr I	20000	3353.29	Ce III	2000	3359.68	Sc II	240	3366.55	Ce II
200	3346.92	Rb III	2500	3353.35	Cl II	60	3359.90	Rh I	140	3366.68	Hf I
130	3346.93	Nb I	320cw	3353.55	Ho II	180	3359.96	Zr II	200 h	3366.72	Xe II
320	3347.02	Mo I	510	3353.58	Dy II	180	3360.06	Hf I	400	3366.75	Tc I
10	3347.04	Ca II	320	3353.59	Nd II	80	3360.21	Pm II	65	3366.81	Ni I
210	3347.27	Tb II	130	3353.66	Zr I	160	3360.30	Cr II	340	3366.96	Nb I
170	3347.30	Sm II	9900	3353.73	Sc II	150	3360.46	Zr I	120	3367.22	Ne II
50	3347.54	Yb II	50 s	3353.87	Pr III	200	3360.54	Ce II	150	3367.27	Sm II
650	3347.736	P IV	750	3353.89	Rb II	200	3360.60	Ne II	120	3367.34	N III
200	3347.83	Dy II	120	3353.91	Os	780	3360.71	Gd II	200 s	3367.35	Pr III
95	3347.84	Cr II	310	3354.179	Th II	280	3360.80	Rh I	500 s	3367.58	Pr III
10000	3347.87	Pu II	410 d	3354.18	Sm II	290	3360.99	Ti I	60	3367.63	Be I
210	3348.07	Tb II	160	3354.27	O IV	250	3361.15	Os I	45	3367.64	Eu II
230	3348.08	O IV		3354.30	Sm II	200	3361.15	Ru I	15	3367.79	Ca III
360	3348.52	Al III	40	3354.38	Eu II	7200	3361.21	Ti II	10000 l	3367.79	Cf
240	3348.68	Sm II	180	3354.39	Zr II		3361.26	Ti I	390	3367.819	Th II
60	3348.72	Rb I	100	3354.45	Pm I	1700	3361.27	Sc II	150	3367.82	Zr II
310	3348.768	Th I	150	3354.45	W I	7	3361.28	Ar III	65	3367.89	Ni I
500	3348.84	Ni II	1	3354.55	He I	250	3361.37	Mo I	1400 d	3368.02	Er II
4300	3349.04	Ti II	320	3354.58	Ho II	12	3361.41	Mg III	430	3368.05	Cr II
1700	3349.06	Nb I	4100	3354.64	Ti I	330	3361.56	Ni I	510	3368.11	Dy II
65	3349.07	Cr I	12 d	3354.71	Ti III	75	3361.738	Th II		3368.13	Er I
270	3349.11	O IV	170	3354.72	Sm II	65	3361.77	Cr II	50	3368.18	Ba III
500	3349.24	Ni II	340	3354.74	Nb I	120	3361.84	Ti I	420	3368.38	Rh I
55	3349.32	Cr I	230	3354.86	Tm II	12	3361.92	Ca I	30 h	3368.44	Au I
12000	3349.41	Ti II	250 s	3354.91	Pr III	1700	3361.94	Sc II	370	3368.45	Ru I
760	3349.42	Tb II	200	3355.02	Ce II	160	3362.00	Y II	560	3368.48	Ir I
420	3349.52	Nb I	200	3355.02	Ne II	9	3362.14	Ca I	800	3368.56	Cs II
10000	3349.63	Pu I	100	3355.15	Au I	120	3362.16	Ne II	340	3368.57	Sm II
500	3349.64	Br III	400	3355.227	Fe I	60	3362.18	Rh I	10000	3368.86	Pu I
230	3349.99	Tm I	80	3355.517	Fe I	55	3362.21	Cr I	4000	3368.95	Sc II
470	3350.06	Er II	300	3355.53	I II	5400	3362.23	Gd II	140	3369.06	Eu II
200	3350.10	Gd II	140	3355.67	Pr II	320	3362.25	Tb II	15	3369.15	Tl II
11	3350.21	Ca I	200	3355.93	Nd II	10000	3362.26	Pu II	130	3369.16	Nb II
350	3350.26	Er II	760	3356.09	Zr II	100	3362.44	Yb II	340	3369.46	Sm II
9	3350.36	Ca I	240 d	3356.33	Re I	500 s	3362.55	Am II	60	3369.546	Fe I
110	3350.40	Eu I	10000	3356.61	Pu II	4000	3362.61	Tm II	5	3369.57	Ge III
5400	3350.47	Gd II	130	3356.78	Hf I	100	3362.71	Ne II	2900	3369.57	Ni I
360	3350.49	Ho II	80 h	3356.80	Ba I	200	3362.74	Re I	30	3369.68	Ba III
60	3350.56	Tc I	130	3357.04	Nb I	60	3362.79	Te II	45	3369.68	Rh I
75	3350.82	Rb I	240	3357.22	Ce II	500	3363.45	Ni II	12	3369.808	Ne I
50 c	3350.83	Tc I	540	3357.26	Zr II	50	3363.64	Yb II	40	3369.908	Ne I
290	3350.88	Al III	65 d	3357.30	Sc II	950	3363.78	Mo I	120	3370.20	Os I
220	3350.88	Sm II	500 l	3357.56	Pr III	150	3363.82	Zr II	1100	3370.44	Ti I
8	3350.91	In III	220	3357.61	Gd I	1400	3364.08	Er II	450	3370.454	Cu II
25	3350.924	Ar II	120	3357.82	Ne II	190	3364.12	Os I	450	3370.55	Er II
50 w	3351.07	Pr III	390	3357.84	U I	6	3364.22	K III	960	3370.59	Os I
35	3351.09	Yb II	320	3357.91	Ho II	270	3364.24	Gd II	170	3370.59	Sm II
980	3351.228	Th II	230	3357.97	Os I	320	3364.27	Ho II	150	3370.59	Zr I
400	3351.25	Sr I	30	3358.0	Xe III	20	3364.30	Yb III	230 d	3370.61	Tb II
50	3351.26	Yb	200	3358.02	Re I	80	3364.44	Pm II	10000	3370.64	Pu II
40	3351.56	Eu II	1600	3358.12	Mo I	570	3364.467	P IV	120	3370.783	Fe I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
290	3370.87	Ho II	150	3377.46	Zr II	200	3383.68	Ce II	290 c	3390.75	Ho II
150	3371.04	W I	2900 d	3377.48	Ti I	5700	3383.76	Ti II	75	3390.78	Eu II
400	3371.05	Gd III		3377.58	Ti I	60	3383.978	Fe I	1300	3391.05	Ni I
400	3371.122	P IV	110	3377.62	V I	310	3384.00	Os I	100 s	3391.08	Pr III
200	3371.18	Ce II	90	3377.68	Pm II	2000	3384.01	Yb III	50	3391.10	Yb II
10000	3371.19	Pu I	80	3377.71	Rh I	80	3384.12	Xe III	150	3391.11	Sm II
340	3371.21	Sm II	240	3377.74	Re I	140	3384.14	Hf II	100	3391.28	Pm II
170	3371.33	Nb I	120	3378.02	Ru I	1900	3384.62	Mo I	380	3391.28	Tb II
4300	3371.45	Ti I	130	3378.06	O IV	510	3384.66	Sm II	100 h	3391.31	Au I
320	3371.50	Tb II	500	3378.22	Ne II	230	3384.70	Hf II	10000	3391.41	Pu II
640	3371.54	Ta I	55	3378.34	Cr II	6	3384.86	K II	95	3391.43	Cr II
100	3371.80	Ne II	390	3378.573	Th II	150	3384.86	Sm	160 h	3391.55	Lu I
100	3371.86	Ru I	50	3378.678	Fe I	100	3384.945	Cu II	15	3391.85	Ar III
100 l	3371.92	Pr III	120	3378.68	Os I	420 d	3384.99	Tm II	210	3391.96	Dy II
400	3371.99	Ni I	320	3378.73	Tb II	5300	3385.02	Dy II	5700	3391.98	Zr II
160	3372.08	Os I	520	3378.86	Tb II	360	3385.05	Ta I	190	3391.99	Eu II
6600	3372.15	Sc II	180	3378.93	Hf I	1700	3385.08	Er II	2300	3392.00	Er II
140	3372.21	Ti II	500	3378.97	Ni II	130	3385.14	Ru I	1300	3392.035	Th II
1100	3372.25	Rh I	320	3379.06	Re II	300	3385.25	Br III	10000	3392.22	Cf I
520	3372.36	Tb II	50 s	3379.13	Pr III	100	3385.25	Hg II	50	3392.23	Tc I
19	3372.67	Ca III	30	3379.17	Cr I	50	3385.49	Cd II	50	3392.304	Fe I
7700	3372.71	Er II	290	3379.22	Ti I	950	3385.50	Lu I	350	3392.34	Nb I
460 d	3372.72	Tb II	30	3379.37	Cr II	360	3385.52	O IV	1100	3392.53	Gd II
5700	3372.80	Ti II	10000	3379.51	Pu I	310	3385.531	Th II	370	3392.54	Ru I
5000	3373.00	Pd I	100	3379.60	Ru I	170	3385.66	Ti I	150	3392.56	Yb III
180	3373.42	Zr II	320	3379.70	Re I	200	3385.76	Re I	150	3392.651	Fe I
200	3373.46	Ce II	220	3379.76	Gd II	110	3385.78	Rh I	140	3392.71	Ti I
7	3373.47	Ar I	285	3379.8	Se III	190	3385.94	Os I	2000 h	3392.78	Ac III
6	3373.60	K II	95	3379.83	Cr II	1400	3385.95	Ti I	300	3392.80	Ne II
200	3373.73	Ce II	950	3379.97	Mo I	170	3386.21	Hf I	230	3392.81	Hf I
390	3373.75	W I	50	3380.110	Fe I	170	3386.24	Nb II	800	3392.89	Cl III
25	3374.10	Te II	130	3380.18	Ru I	310	3386.501	Th II	55	3392.99	Cr II
230	3374.16	Ho II	150 s	3380.21	Pr III	210	3386.57	Dy II	3300	3392.99	Ni I
970	3374.17	Er II	65	3380.25	Eu II	40	3386.67	Tc I		3393.	Li
260	3374.22	Ni I	1400	3380.28	Ti II	450	3387.2	Se III	1200	3393.03	Rb II
60	3374.35	Ti II	270	3380.41	Nb I	11	3387.37	Mg III	570	3393.12	Zr II
490	3374.50	Tm II	220	3380.52	Gd II	10000 s	3387.45	Bk II	800	3393.45	Cl III
130	3374.64	Ni I	500	3380.56	Br IV	140	3387.50	Yb I	3800	3393.57	Dy II
130	3374.65	Ru I	3300	3380.57	Ni I	150	3387.66	Sm II	290	3393.63	Nd II
220	3374.69	Gd II	6	3380.62	K II	80	3387.70	Co II	10000	3393.67	Pu I
10000	3374.70	Cm I	650	3380.71	Sr II	620	3387.84	Os I	7	3393.73	Ar I
380	3374.73	Zr II	200	3380.712	Cu II	1400	3387.84	Ti II	70	3393.84	Cr II
350	3374.92	Nb I	240	3380.85	Ni I	570	3387.87	Zr II	300	3394.18	Tc I
4	3374.94	Ga II	130	3380.859	Th I	110	3387.920	Th I	1000 w	3394.22	Pr III
300	3374.952	Cu II	130	3380.86	Nb I	12	3388.13	Fe II	55	3394.30	Cr II
40	3374.96	Kr III	1500	3380.91	La II	1100	3388.17	Co I	10000	3394.32	Pu I
250	3374.974	Th I	8	3381.00	Tl II	760	3388.30	Zr II	50 h	3394.44	Yb II
520	3375.03	Tb II	360	3381.20	O IV	150	3388.42	Ne II	3000 l	3394.49	Pa
200	3375.40	O IV	10	3381.24	Mg III	25	3388.531	Ar II	1100	3394.58	Ti II
240	3375.48	Yb II	150 s	3381.26	Pr III	85	3388.59	Y I	230	3394.59	Hf II
10000	3375.80	Pu I	290	3381.32	Er II	130	3388.71	Ru I	320 c	3394.60	Ho II
1	3375.95	Ga II	6	3381.80	Tl II	60	3388.76	Ti II	110	3394.62	Pr II
110	3376.27	Zr II	10000	3381.82	Pu I	610	3388.85	Dy II	340	3394.77	U II
200	3376.33	La II	300 s	3381.84	Pr III	30	3388.88	Cd II	140	3394.98	Hf II
30	3376.40	Cr I	10	3381.90	Au I	120	3388.94	Ne II	200 l	3395.01	Am I
25	3376.436	Ar II	10000	3381.97	Pu II	8	3389.01	Hg III	540	3395.12	Gd II
150	3376.48	Sm II	230	3382.06	Er I	410	3389.32	Sm II	130	3395.36	Mo II
6200	3376.50	Lu I	170	3382.31	Ti I	240	3389.43	Re I	2200	3395.38	Co I
75 c	3376.59	In II	1200	3382.40	Sm II	100	3389.50	Ru I	100	3395.40	Au I
50	3376.62	Yb II	320	3382.48	Mo I	450	3389.74	Er II	10000	3395.77	Ce III
10000	3376.76	Pu II	28	3382.54	Yb	800	3389.83	Hf II	170	3395.93	Nb I
10000	3376.94	Pu II	140	3382.68	Cr II	285	3390.25	O II	350	3396.07	Er II
60 r	3377.08	Ba I	10000	3382.70	Pu I	200	3390.25	Re I	600 d	3396.07	Pr III
480	3377.13	Ce II	320	3382.80	Tb II	50	3390.25	Yb II	1300	3396.16	Dy II
100 s	3377.14	Pr III	28000 r	3382.89	Ag I	10000	3390.33	Pu II	410	3396.19	Sm II
110	3377.14	Rh I	11	3382.90	Mg III	730	3390.38	U I	160	3396.33	Zr II
220	3377.20	O II	12	3383.09	Sb II	28	3390.42	Yb II	280	3396.58	Eu II
10000	3377.37	Pu II	100	3383.15	Sb I	210	3390.60	Tb II	300 s	3396.62	Pr III
20	3377.39	Ba I	200 s	3383.53	Ac II	140	3390.68	Ti I	200	3396.727	Th I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
270	3396.79	O IV	650	3404.72	Re I	250	3413.012	Th I	150 s	3420.07	Pr III
1400	3396.82	Lu I	100	3404.82	Ne II	250	3413.131	Fe I	60	3420.16	Rh I
5600	3396.82	Rh I	570	3404.83	Zr II	100	3413.15	Ne II	70 r	3420.32	Ba I
290	3396.84	Er II	200	3404.91	Ce II	500 c	3413.21	Pr III	400 d	3420.34	Tb II
60	3396.90	Tc I	11000	3405.12	Co I	220	3413.27	Gd II	6	3420.82	K III
45	3397.04	Y I	80	3405.33	Tc I	330	3413.48	Ni I	25	3421.01	Ba I
4100	3397.07	Lu II	230	3405.41	Nb I	150	3413.53	W I	210	3421.21	Cr II
550 c	3397.21	Bi I	200	3405.558	Th I	200	3413.543	P IV	390	3421.210	Th I
220 d	3397.22	Gd I		3405.6	Be II	230	3413.64	O IV	330	3421.22	Rh I
230	3397.26	Hf I	650	3405.89	Re I	520	3413.76	Tb II	13000	3421.24	Pd I
	3397.32	Gd I	1300	3405.94	Mo I	1300	3413.78	Dy II	30 h	3421.48	Ba I
300 l	3397.46	Pr III	240	3405.98	Ce II	200	3413.84	Ac II	1200	3421.63	Ho II
1700	3397.50	Tm II	130	3406.13	Nb I	450	3413.9	Se III	120	3421.69	Os I
230	3397.60	Hf I	160	3406.55	Rh I	330	3413.94	Ni I	4	3421.83	K III
100	3397.66	Yb III	150	3406.79	Te II	20	3414.27	Ge III	300 l	3422.22	Pr III
150	3397.76	Sm II	200	3406.92	Gd I	140	3414.65	F II	250	3422.31	Mo I
40	3397.83	Tc I	450	3406.94	Ta I	380	3414.66	Zr I	150	3422.42	W I
300	3398.33	Tc I	120	3406.95	Ne II	8200	3414.76	Ni I	6900	3422.47	Gd II
230	3398.33	Ta I	380	3407.16	Dy II	530	3414.82	Dy II	600	3422.71	Ce II
270	3398.35	Tb II	60	3407.20	Ti II	1400 c	3414.90	Ho II	270	3422.74	Cr II
250	3398.544	Th I	80	3407.28	Tc I	300 s	3415.15	Pr III	390	3422.75	Gd II
60	3398.63	Ti I	220	3407.38	O II	100	3415.40	Tm III	65	3423.09	Eu II
4000	3398.91	Ce III	500	3407.458	Fe I	750	3415.58	Rb II	1600	3423.71	Ni I
8100 c	3398.98	Ho II	2	3407.48	Sn II	30	3415.77	Co II	180	3423.76	Nb I
320	3399.10	Tb II	1100 d	3407.56	Gd II	100	3415.96	Tm III	350	3423.82	Br II
4000	3399.30	Re I		3407.61	Gd II	180	3415.97	Nb I	50	3423.84	Co II
150	3399.333	Fe I	200	3407.73	Tm III	270	3416.24	Tb II	1100	3423.90	Gd I
380	3399.35	Zr II	140	3407.76	Hf II	150	3416.45	F II		3423.92	Gd II
120	3399.40	Nb I	5300	3407.80	Dy II	5400	3416.46	Ho II	270	3423.989	Th I
200	3399.41	Gd II	100	3408.06	Pm II	340	3416.59	Tm I	9	3424.25	Ar III
820	3399.70	Rh I	340	3408.13	Pt I	90	3416.68	Sc I	60	3424.284	Fe I
2300	3399.80	Hf II	420	3408.14	Dy II	140	3416.80	F II	120 d	3424.38	Rh I
150	3399.84	Sm II	10000	3408.28	Bk I	120	3416.91	Ne II	580	3424.56	U II
420	3399.95	Tm II	50	3408.33	Tc I	1400	3416.95	Gd II	830	3424.59	Gd II
540	3399.99	Gd II	270	3408.38	Nb I	160	3417.00	F II	8000	3424.62	Re I
2	3400.07	Xe I	240	3408.67	Re I	2700	3417.16	Co I	120	3424.78	Sm II
30	3400.12	Mn II	230	3408.68	Nb II	230	3417.34	Hf I	250 c	3424.99	I II
170	3400.21	Hf I	850	3408.68	Sm II	3100	3417.35	Ru I	100	3425.00	P II
170	3400.40	V I	360	3408.76	Cr II	290	3417.45	Ce II	150	3425.02	Eu II
270	3400.53	Tb II	120	3408.76	Os I	7	3417.49	Ar III	530	3425.06	Dy II
210 d	3400.86	Tb II	4500	3409.18	Co I	50	3417.49	Cd II	110	3425.07	V I
50	3401.01	Yb II	180	3409.19	Nb II	50	3417.497	Th I	6400	3425.08	Tm II
500	3401.05	Ni II	310	3409.28	Ru I	350	3417.63	Er II	2000 c	3425.34	Ho II
120	3401.17	Os I	250	3409.30	Gd II	120	3417.69	Ne II	230	3425.42	Nb II
310	3401.74	Ru I	130	3409.58	Ni I	500	3417.77	Ac II	950	3425.63	Tm II
390	3401.83	Er II	230	3409.66	O IV	320	3417.77	Re I	130	3425.85	Nb I
620	3401.86	Os I	95	3409.81	Ti II	50	3417.904	Ne I	390	3425.93	Gd II
540	3402.07	Gd II	320	3409.83	Re I	15	3418.006	Ne I	360	3426.04	Yb I
200	3402.10	Tc I	160	3409.84	O II	270	3418.15	Sm II	400	3426.19	Re I
420	3402.33	Tb II	850	3410.05	Tm I	40 c	3418.20	Tc I	170	3426.20	Sm II
30	3402.40	Cr II	230	3410.17	Hf II	2	3418.37	Xe I	390	3426.21	Ce II
60	3402.42	Ti II	760	3410.25	Zr II	140	3418.39	Yb I	50 c	3426.27	Pr III
600	3402.46	Sm II	810 c	3410.26	Ho II	430	3418.51	Sm II	45	3426.44	Eu II
180	3402.51	Hf I	210	3410.40	Tb II	130	3418.51	Sc I	230	3426.57	Nb II
250	3402.51	Os I	390 c	3410.65	Ho II	240	3418.52	Mo I	6	3426.86	Na I
400	3402.97	Gd III	210	3410.68	Tb II	1400	3418.73	Gd II	10000	3426.95	Bk I
50 l	3402.97	Pr III	220	3411.02	Gd I	10000	3418.88	Pu II	500 l	3427.02	Pr III
210	3403.09	Sm II	410	3411.69	O IV	100	3419.10	Tc I	500	3427.119	Fe I
170	3403.32	Cr II	40	3411.80	Tc I	410	3419.18	Hf I	30000	3427.36	Ce III
360	3403.52	O IV	10000 l	3412.13	Bk II	125	3419.34	P II	500	3427.40	Pm II
800	3403.652	Cd I	820	3412.27	Rh I	65	3419.36	Sc I	140	3427.44	Hf I
10 h	3403.78	Ag I	6700	3412.34	Co I	810	3419.41	Re I	230	3427.45	Nb I
200 c	3403.93	Tc I	50	3412.45	Yb I	780	3419.63	Dy II	300	3427.61	Re I
35	3404.10	Yb II	85	3412.47	Y I	20	3419.63	Te II	150	3427.67	Os I
6	3404.24	K II	340	3412.59	Tm I	200 s	3419.66	Am II	150	3427.71	W I
100 c	3404.28	In II	2200	3412.63	Co I	170	3419.77	Sm II	60	3427.85	Tc I
640	3404.34	Mo I	120	3412.74	Os I	45	3419.84	Eu II	35	3427.93	Pt I
80	3404.353	Fe I	230	3412.94	Nb II	2	3420.00	Xe I	2000 c	3428.13	Ho II
24000	3404.58	Pd I	150	3412.96	W I	250	3420.04	Mo I	4900	3428.31	Ru I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
200	3428.37	Hf II	150	3437.44	Tc I	1000	3443.876	Fe I	250	3452.60	Mo I
490	3428.39	Er II	10000 l	3437.47	Bk I	80	3444.10	O III	10	3452.66	Ca II
285	3428.4	Se III	100	3437.50	Ir I	60	3444.2	Xe III	3000 l	3452.82	Pa II
80	3428.46	Yb II	320	3437.71	Re I	890	3444.31	Ti II	1300	3452.89	Ni I
220	3428.47	Gd II	8	3438.04	Ar III	120	3444.46	Os I	10000	3452.92	Cm I
50	3428.622	Th I	170	3438.06	Sm II	320	3444.58	Tb II	3200	3453.14	Ho II
120	3428.69	Ne II	4700	3438.23	Zr II	70	3444.86	Al I	180	3453.17	La II
60	3428.748	Fe I	250	3438.24	Hf II	200	3445.149	Fe I	190	3453.33	Cr I
150	3428.92	Al II	260	3438.37	Ru I	45	3445.18	Eu II	21000	3453.50	Co I
130	3429.04	Nb I	110 d	3438.40	In II	50 l	3445.29	Pr III	240	3453.50	Re I
630 c	3429.18	Ho II	140	3438.43	Hf I	160	3445.55	Os I	360	3453.55	U II
200	3429.21	Sc I	50	3438.71	Yb II	3800	3445.57	Dy II	170	3453.56	Sm II
340	3429.33	Tm I	80	3438.73	Tc I	170	3445.62	Cr I	15	3453.61	Fe II
420	3429.44	Dy II	100	3438.85	Yb II	130	3446.08	Mo II	4900	3453.66	Tm II
200	3429.48	Sc I	250	3438.87	Mo I	200	3446.19	Am I	40	3453.74	Cr I
230	3429.59	W I	330	3438.94	Dy II	4800	3446.26	Ni I	10000 l	3453.90	Bk I
850	3429.96	Tm II	340	3438.949	Th II	11	3446.37	K I	70 s	3454.05	Pr III
1000	3430.53	Zr II	50	3438.97	Mn II	50	3446.39	Co II	810	3454.06	Tb II
210	3430.61	Tb II	1700	3439.21	Gd II	210	3446.40	Tb II	500	3454.08	Yb II
50	3430.76	Sr III	250	3439.26	Rb III	3	3446.46	Ga II	540	3454.14	Gd II
490	3430.77	Ru I	60	3439.30	Ti I	50	3446.547	Th I	50	3454.195	Ne I
10	3430.83	Bi II	70	3439.35	Al I	35	3446.89	Yb II	70	3454.2	Xe III
240	3431.11	Yb I	90	3439.41	Sc I	830	3446.99	Dy II	320	3454.23	U II
420	3431.19	Tm II	100	3439.46	Kr III	30	3447.02	Cr I	2700	3454.32	Dy II
12	3431.23	Bi II	270	3439.72	Tb II	3200	3447.12	Mo I	30000	3454.39	Ce III
270	3431.36	Sc I	830	3439.78	Gd II	2	3447.26	Ga II	440	3454.51	Dy II
2500	3431.58	Co I	2700	3439.99	Gd II	450	3447.36	Br III	880	3454.90	Gd II
40	3431.75	Tc I	7	3440.05	K II	600	3447.36	Zr I	80	3455.12	O III
320 c	3432.10	Ho II	65	3440.18	Sc I	10	3447.38	K I	40	3455.12	Te II
10000 l	3432.62	Bk I	220	3440.20	Ru I	170	3447.43	Cr I	300	3455.18	Be I
180	3432.70	Nb II	30 h	3440.36	Au I	2	3447.59	He I	400	3455.22	Rh I
310	3432.74	Ru I	520	3440.37	Tb II	60	3447.703	Ne I	1000	3455.23	Co I
80	3432.94	Yb III	240	3440.50	Sm II	120	3447.74	Rh I	200	3455.27	Gd I
690	3432.99	Gd II	1400	3440.53	Rh I	70	3447.76	Cr I	60	3455.42	Rh I
4500	3433.04	Co I	180	3440.59	Nb II	50	3448.41	V IV	130	3455.60	Cr I
320	3433.26	Tb II	250	3440.60	Os I	65	3448.49	Sc I	810 c	3455.70	Ho II
140	3433.31	Cr II	6000	3440.606	Fe I	60	3448.58	Rh I	100	3455.72	Ge II
5000	3433.45	Pd I	150 l	3440.62	Pr III	200	3448.82	Y II	200	3455.91	Zr I
2600	3433.56	Ni I	45	3440.82	Eu II	410	3448.97	Ir I	16000 c	3456.00	Ho II
270	3433.60	Cr I	560	3440.93	Dy II	640	3449.07	Mo I	40	3456.18	Yb III
170	3433.68	Sm II	2500	3440.989	Fe I	4100	3449.17	Co I	9	3456.34	Tl III
980	3433.998	Th II	150	3441.00	Eu II	310	3449.20	Os I	950	3456.39	Mo I
40	3434.03	Ge III	70	3441.12	Cr I	390	3449.35	Ho I	180	3456.39	Ti II
55	3434.11	Cr I	770	3441.13	Er II	400	3449.37	Re I	1300	3456.56	Dy II
1000	3434.18	Rb II	120	3441.15	Pm II	2100	3449.44	Co I	100	3456.61	Ne II
1900	3434.37	Dy II	290	3441.21	Ce II	270	3449.46	Tb II	200	3456.85	Tc I
45	3434.61	Yb II	6400	3441.40	Pd I	390	3449.62	Gd II	20	3456.88	Te II
200	3434.70	Tc I	140	3441.44	Cr I	400	3449.80	Pm II	85	3457.05	Eu I
380	3434.79	Mo I	250	3441.44	Mo I	440	3449.89	Dy II	200	3457.05	Gd II
8200	3434.89	Rh I	1300	3441.45	Dy II	120	3450.29	Rh I	320	3457.05	U II
45	3435.05	Eu II	4900	3441.50	Tm II	1400	3450.38	Gd II	50	3457.068	Th I
65	3435.20	Eu II	100	3441.84	Hf I	5	3450.77	Hg III	180	3457.07	Rh I
320	3435.45	Mo I	720	3441.99	Mn II	70	3450.95	Y I	400	3457.24	Tc I
580	3435.49	U I	50	3442.25	Te II	40 h	3451.0	Bi III	270	3457.45	Sc I
530	3435.56	Sc I	50	3442.42	Cd II	200	3451.05	Tc I	45	3457.56	Eu II
40	3435.68	Tc I	110	3442.578	Th I	60	3451.15	Rh I	410	3457.56	Zr II
40	3435.72	Eu II	35	3442.63	Rh I	1100	3451.23	Gd II	40	3457.60	Tc I
770	3435.976	Th II	10000	3442.66	Bk I	10	3451.25	Co III	320	3457.71	U II
160	3436.19	Cr I	3	3442.66	Xe I	450	3451.29	B II	450	3457.8	Se III
300 l	3436.36	Pr III	390	3442.68	Er I	5	3451.37	Be I	220	3457.93	Rh I
2	3436.66	Ga II	1600	3442.93	Co I	400	3451.69	Hg II	70	3458.22	Al I
6400	3436.74	Ru I	240	3443.00	W I	130	3451.702	Th I	190 d	3458.29	Yb II
100	3436.93	Tm III	250	3443.26	Mo I	300	3451.75	Mo I	10000	3458.34	Cm I
660	3437.02	Ir I	200 c	3443.47	Tc I	16000 c	3451.88	Re I	120	3458.38	Os I
150	3437.10	Sm II	35	3443.59	Yb	1000 l	3452.10	Am II		3458.39	Yb I
380	3437.14	Zr II	40000	3443.63	Ce III	130	3452.18	La II	5000	3458.47	Ni I
360	3437.15	N II	150	3443.64	Al I	100	3452.31	Hf I	100 w	3458.7	Xe III
640	3437.22	Mo I	8800	3443.64	Co I	85	3452.40	Yb I	200	3458.93	Zr II
990	3437.28	Ni I	30	3443.79	Cr I	60	3452.47	Ti II	170	3459.20	Sm II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
100	3459.32	Ne II	360 c	3467.07	Ho II	500	3473.54	Al IV	10000	3481.15	Pd I
40000	3459.39	Ce III	100	3467.21	Au I	40	3473.61	Cr I	1300	3481.15	Zr II
120	3459.42	Sm II	95	3467.26	Ti I	10000	3473.64	Pu II	500 s	3481.16	Ac II
360	3459.92	U I	1700	3467.27	Gd II	380	3473.70	Dy II	2200	3481.28	Gd II
50	3460.03	Mn II	200	3467.50	Ni I	260	3473.75	Ru I	70	3481.30	Cr I
250	3460.25	Pm II	210	3467.51	Tm I	40	3473.8	Bi III	240	3481.30	Ru I
360	3460.27	Yb I	140	3467.60	Hf I	810 c	3473.91	Ho II	55	3481.54	Cr I
360	3460.33	Mn II	800	3467.655	Cd I	130	3473.96	Sm II	340	3481.75	Tm II
380	3460.38	Tb II	70	3467.72	Cr I	8000	3474.02	Co I	1700	3481.80	Gd II
100	3460.43	Cr I	250	3467.85	Mo I	360 h	3474.04	Mn II	200	3481.93	Ne II
55000 c	3460.46	Re I	170	3467.87	Sm II		3474.13	Mn II	300	3481.93	Np I
6 d	3460.48	Tl II	85	3467.88	Eu I	5400 c	3474.26	Ho II	120	3482.11	Os I
25	3460.524	Ne I	110	3467.88	Y II	70	3474.65	Kr III	240	3482.23	Re I
7700	3460.77	Pd I	400	3467.93	Tm III	11	3474.76	Ca I	240	3482.35	Ce II
640	3460.78	Mo I	400	3467.96	Re I	170	3474.78	F II	680	3482.49	U II
4400	3460.97	Dy II	620	3468.03	Tb II	4700	3474.78	Rh I	50	3482.56	Yb II
7	3461.07	Ar I	390	3468.219	Th II	120	3474.89	Sr II	490	3482.60	Gd II
240	3461.13	Sm II	40	3468.22	Xe III	80	3475.18	Tc I	60	3482.63	Al I
10000 s	3461.24	Bk II	6	3468.32	K III	2000	3475.450	Fe I	290	3482.91	Mn II
100 h	3461.26	Xe II	720	3468.43	Dy II	1000	3475.59	Tc I	500	3482.99	N IV
130	3461.38	Eu II	9	3468.48	Ca I	70	3475.82	Ag II	230	3483.04	Tb II
1500	3461.50	Rb II	1700	3468.99	Gd II	500	3476.30	Yb II	25	3483.08	Cd II
600	3461.50	Ti II	30	3469.16	Ag I	240	3476.44	Re I	10000	3483.20	Pu I
5000	3461.65	Ni I	320	3469.22	Mo I	20	3476.56	Be I	5000 l	3483.31	Am II
20	3461.87	Ca II	130	3469.44	Nb I	340	3476.69	Tm I	1900	3483.41	Co I
220	3461.95	Gd II	240	3469.49	Ni I	500	3476.702	Fe I	60	3483.43	Pt I
1600	3461.97	Ho II	490	3469.51	Er I	70	3476.747	Ar II	760	3483.54	Zr II
5900	3462.04	Rh I	45	3469.59	Cr I	480	3476.84	Ce II	40	3483.67	Te II
180	3462.19	Sc I	180	3469.62	Rh I	1300	3477.07	Dy II	230	3483.69	Tb II
8500	3462.20	Tm II	130 d	3469.65	Sc I	75	3477.07	Eu I	1250 h	3483.76	Cu I
320	3462.22	U I	4	3469.81	Xe I	600	3477.18	Ti II	550	3483.77	Ni I
35	3462.34	Yb II	1300	3469.920	Th II	10000 s	3477.62	Bk II	95	3484.04	Rh I
140	3462.64	Hf II	20	3469.98	Yb III	160	3477.94	W I	100	3484.05	Nb II
5100	3462.80	Co I	5	3470.34	Ga II	20	3478.232	Ar II	60	3484.62	Tc I
340	3462.850	Th II	150	3470.51	Tc I	120	3478.53	Os I	6300	3484.84	Ho II
200	3462.91	Pm II	4700	3470.66	Rh I	290	3478.69	Nb I	120 h	3484.88	Nd I
230 d	3462.97	Tb II	285	3470.81	O II	570	3478.71	N IV	400	3484.96	N IV
220	3463.00	Gd II	60000	3470.92	Ce III	200	3478.79	Zr I	710	3485.05	Ce II
820	3463.02	Zr II	110	3471.13	Sc I	500	3478.84	Yb II	160	3485.27	Pt I
90	3463.37	N IV	560	3471.14	Dy II	2100	3478.91	Rh I	35	3485.5	Bi III
150	3463.51	Yb III	100	3471.19	Nb I	60	3478.92	Ti I	10	3485.61	Ca II
460	3463.55	U I	600	3471.19	Zr I	200	3478.99	Hf II	60	3485.69	Ti I
40	3463.74	Ba I	170	3471.218	Th I	250	3479.173	Th II	170	3485.73	Y I
230	3463.77	Ta I	9	3471.32	Ar III	480	3479.28	Hf II	85	3485.76	Yb II
170	3463.81	Nb I	1	3471.46	Ga II	1200	3479.39	Zr II	970	3485.85	Er II
2700	3463.98	Gd II	560 d	3471.53	Dy II	610	3479.41	Er II	130	3485.89	Ni I
120	3464.07	Sm II	30	3471.61	Au I	150	3479.52	Ne II	110	3485.92	V II
10000 s	3464.13	Bk II	970	3471.71	Er II	2	3479.53	I III	240	3485.93	Mo I
30	3464.339	Ne I	270	3471.73	Tb II	130	3479.53	Sm II	20	3486.11	Te II
2400	3464.37	Yb I	10000 s	3472.02	Bk II	200	3479.56	Nb II	220	3486.20	Gd I
100	3464.43	Cd II	120	3472.25	Rh I	60	3479.81	Al I	1000 c	3486.23	Tc I
950	3464.46	Sr II	4	3472.36	Xe I	70	3480.052	Th I	200	3486.552	Th I
8	3464.59	Ge III	270	3472.37	Tb II	380	3480.17	Tb II	350	3486.82	Er II
40000 c	3464.73	Re I	710	3472.40	Hf I	130	3480.26	Sm II	15	3486.91	Si III
10000	3465.10	Pu II	10	3472.46	Sn II	20	3480.32	Te II	420	3487.38	Tm I
65	3465.25	Cr I	4800	3472.48	Lu II	360	3480.36	U I	170	3487.41	Sm II
120	3465.44	Os I	1	3472.52	Ga II	400	3480.38	Re I	120	3487.46	Os I
110	3465.74	Pr II	390	3472.52	U II	490	3480.52	Ta I	400	3487.58	Br III
5100	3465.80	Co I	1600	3472.54	Ni I	240	3480.53	Ti I	3000	3487.59	Ac III
180	3465.86	Nb I	60	3472.571	Ne I	200	3480.54	Er III	13	3487.60	Ca I
1200	3465.860	Fe I	16	3472.76	Cr I	20	3480.55	Ar III		3488.	Li I
130	3465.924	Th II	810 d	3472.79	Tb II	170	3480.56	Sm II	85	3488.43	Yb II
1000	3466.200	Cd I	24	3472.91	Cr I	200	3480.61	Pm II	100	3488.59	Kr III
5000 c	3466.28	Tc I	160	3472.96	F II	200	3480.72	Ne II	180	3488.68	Mn II
630	3466.30	U I	210	3473.00	Tb II	320	3480.85	Re I	40	3489.08	Ge III
30	3466.579	Ne I	140	3473.02	Nb I	340	3480.98	Tm I	100	3489.184	Th I
320	3466.83	Mo I	1400	3473.22	Gd II	10000	3481.07	Cf	1600	3489.37	U I
330	3466.95	Gd II	150	3473.31	F II	6	3481.11	K III	4800	3489.40	Co I
40	3467.02	Cr I	320	3473.43	U I	6	3481.11	K II	290 d	3489.51	Tb II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
200	3489.53	Ac II	160	3498.54	Os I	7000	3506.32	Co I	830	3513.65	Gd I
490	3489.58	Ho II	130	3498.621	Th I	300	3506.47	Br III	320	3513.67	U I
60	3489.74	Ti II	500	3498.63	Nb I	120	3506.64	Ti I	250	3513.817	Fe I
2000	3489.77	Pd I	830	3498.71	Dy II	50	3506.645	Th I	5	3513.88	K III
300	3489.79	Po	1200	3498.73	Rh I	5	3506.74	Xe I	260	3513.93	Ni I
200	3489.83	O IV	810 c	3498.88	Ho II	1300	3506.81	Dy II	10	3514.23	Co II
100	3490.30	Tc I	200	3498.91	Sc I	410 c	3506.95	Ho II	80 h	3514.25	V IV
120	3490.33	Os	8300	3498.94	Ru I	100 c	3507.19	Tc I	70	3514.388	Ar II
2500	3490.574	Fe I	100	3498.98	Hf I	2800	3507.32	Rh I	500	3514.41	Ce III
230	3491.03	Nb I	6700	3499.10	Er II	780	3507.34	U I	640	3514.49	Ru I
480	3491.05	Ti II	95	3499.10	Ti I	8300 c	3507.39	Lu II	5	3514.60	Rn I
80	3491.07	Rh I	40	3499.14	Tc I	4	3507.41	Tl III	1600	3514.61	U I
50	3491.244	Ar II	300	3499.21	Ge II	200	3507.42	Kr III	100	3514.85	Pm II
100	3491.536	Ar II	9	3499.59	Fe III	570	3507.45	Tb II	490	3514.89	Er II
980	3491.95	Gd II	12	3499.67	Ar III	55	3507.69	Ni I	6600	3515.05	Ni I
210 d	3492.00	Tb II	220	3499.84	Sm II	50	3507.77	Co II	25	3515.191	Ne I
900	3492.23	Al IV	340	3499.95	Tm I	85	3507.83	Yb II	200	3515.42	Nb II
160	3492.24	O IV	25	3499.952	Cd I	210	3507.94	Ce II	300	3515.54	Be I
210	3492.58	Tm II	630	3500.08	U I	460	3507.96	Nb I	4100 c	3515.59	Ho II
100	3492.68	Rb III	9	3500.28	Fe III	20	3508.03	Ag I	220	3515.95	Ir I
5500	3492.96	Ni I	3	3500.35	Hg III	560	3508.12	Mo I	320	3516.65	Re I
580 c	3493.09	Ho II	1000	3500.70	Tc I	100	3508.27	Tc I	12000	3516.94	Pd I
390	3493.33	U II	810	3500.84	Tb II	390	3508.38	Er II	50	3517.00	Yb I
400	3493.39	Tc I	660	3500.85	Ni I	1600	3508.42	Lu I	500	3517.09	La III
270	3493.518	Th II	200 r	3501.11	Ba I	800	3508.46	Al IV	600	3517.22	La III
170	3493.61	Sm II	250	3501.16	Os I	160	3508.73	W I	560	3517.26	Dy II
200	3493.65	Po	30	3501.216	Ne I	320	3508.84	U II	560	3517.30	V II
340	3494.00	U I	200	3501.24	Tc I	30 h	3509.04	Au I	320	3517.33	Re I
270	3494.21	Tb II	190	3501.39	F II	5700	3509.17	Tb II	450	3517.36	Br III
1700	3494.40	Gd II	200	3501.45	F II	1000	3509.32	Zr I	600	3517.38	Ce II
110	3494.44	Rh I	400	3501.50	Dy II	320	3509.37	Ho II	30	3517.50	Co II
4400	3494.49	Dy II	300 h	3501.50	Np I	390	3509.66	U II	700	3517.56	Al IV
500	3494.62	Tc I	200	3501.57	F II	70	3509.778	Ar II	250	3517.60	Tm I
2500 c	3494.76	Ho II	50	3501.72	Co II	2900	3509.84	Co I	200	3517.67	Nb II
320	3494.84	U II	10	3501.76	Fe III	160	3510.02	W I	390	3518.18	Er II
55	3494.97	Cr I	20 h	3501.92	Ag I	380	3510.10	Tb II	4800	3518.35	Co I
10	3495.16	Ca II	9600	3502.28	Co I	5000	3510.13	Am I	140	3518.404	Th I
400	3495.24	W I	5900	3502.52	Rh I	200	3510.26	Nb II	310	3518.72	Os I
80	3495.28	Ag II	65	3502.60	Ni I	10000	3510.28	Cm I	130	3518.75	Hf II
270	3495.36	Tb II	800 c	3502.70	Tc I	2600	3510.34	Ni I	15	3519.06	Sb III
40	3495.38	Cr II	610	3502.78	Er I	1400	3510.43	Co I	20000	3519.24	Tl I
150	3495.44	Cd II	180	3502.84	F II	200	3510.46	Zr II	60	3519.54	Rh I
2400	3495.69	Co I	200	3502.96	F II	80	3510.54	Cr I	2000	3519.60	Zr I
250	3495.75	Hf II	560	3503.06	Re I	810	3510.73	Ho I	330	3519.64	Ru I
60	3495.75	Ti I	210	3503.11	F II	10	3510.82	Au I	570	3519.76	Tb II
140	3495.84	Mn II	15	3503.58	Ar III	600	3510.84	Ti II	660	3519.77	Ni I
100hw	3495.90	Yb II	70	3503.786	Th I	500 c	3510.85	Bi I	410 c	3519.94	Ho II
1700	3496.09	Y II	240	3503.87	Ta I	100	3510.91	Tc I	390	3519.96	U II
4100	3496.21	Zr II	320	3504.01	U I	490	3511.04	Ta I	120	3520.00	Os I
560	3496.34	Dy II	50	3504.07	Sb III	8	3511.12	Ar III	150	3520.02	V II
530	3496.41	U II	800	3504.41	Mo I	110	3511.157	Th I	200	3520.06	Nb I
50	3496.42	V IV	210	3504.44	V II	340	3511.23	Sm II	1300	3520.08	Co I
50	3496.81	Mn II	830	3504.53	Dy II	500	3511.28	Al IV	60	3520.25	Ti II
70	3496.810	Th I	60000	3504.64	Ce III	60	3511.78	Rh I	230	3520.29	Yb II
350	3496.86	Er II	620	3504.66	Os I	40	3511.84	Cr II	12	3520.47	Sb II
150	3497.13	Pm II	890	3504.89	Ti II	780	3512.22	Gd II	150	3520.472	Ne I
250	3497.16	Hf I	3000	3504.97	Pa I	100 c	3512.28	Re I	210	3520.52	Ce II
110	3497.3	S III	320	3505.07	U II	1100	3512.50	Gd II	70	3521.059	Th I
40	3497.33	Co II	1200	3505.23	Hf II	4800	3512.64	Co I	470cw	3521.09	Eu II
300 c	3497.41	I II	75 h	3505.30	Eu II	440	3512.99	Os I	50	3521.11	Te II
980	3497.49	Hf I	240	3505.32	Mo I	250	3513.02	Tm II	10	3521.12	Ag I
100	3497.54	Mn II	170	3505.37	F II	60	3513.10	Rh I	300	3521.261	Fe I
50000	3497.81	Ce III	60	3505.41	Rh I	320	3513.10	Tb II	3000	3521.39	Rb II
400	3497.81	Dy II	830	3505.45	Dy II	150	3513.28	Hf I	480	3521.41	Mo I
200	3497.81	Nb I	350	3505.48	Zr II	15 h	3513.38	Ag I	80	3521.53	Y I
500	3497.840	Fe I	1400	3505.51	Gd II	10000 l	3513.47	Cf	2700	3521.57	Co I
380	3497.85	Ta I	200	3505.52	F II	3800	3513.48	Co I	50	3521.77	Ga III
25	3498.064	Ne I	220	3505.63	F II	200	3513.61	Ta I	330	3521.88	Ce II
15	3498.46	Sb II	820	3505.67	Zr II	3200	3513.64	Ir I	410	3522.03	Ir I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
3500	3522.28	La IV	10000	3531.49	Cf I	410	3539.59	Er I	330	3548.18	Ni I
10000	3522.36	Cm I	3000 l	3531.55	Rb II	8	3540.08	Tl II	330	3548.19	Dy II
80	3522.83	Xe III	22000	3531.70	Dy II	500	3540.16	Br III	390	3548.20	Mn I
160	3522.89	F II	360	3531.85	Mn I	1100	3540.24	Tb II	310	3548.26	Er II
980	3523.02	Hf I		3532.00	Mn I	530	3540.47	U II	180	3548.81	Hf I
3	3523.34	Au II	1100	3532.12	Mn I	100	3540.52	Mn III	75	3548.87	Cu III
3800	3523.43	Co I	45	3532.23	Eu II	630	3540.76	Ho II	3900	3549.01	Y II
60	3523.51	Co II	220	3532.57	Sm II	15	3540.8	Bi III	320	3549.20	U I
480	3523.64	Os I	230	3532.80	Os I	250	3540.96	Nb II	3900	3549.36	Gd II
1300	3523.66	Tb II	240	3532.81	Ru I	10000	3540.98	Cf I	200	3549.42	Hg II
4400	3523.98	Dy II	1500	3533.05	Na II	500	3541.08	Al IV	7	3549.52	Mg II
100	3524.11	Cd II	100	3533.199	Fe I	300	3541.083	Fe I	1800	3549.54	Rh I
980	3524.20	Gd II	440	3533.22	Zr I	1000	3541.15	Rb II	170	3549.595	Th I
1250	3524.23	Cu I	200	3533.28	Tm III	15	3541.36	Ti IV	45	3549.71	Eu II
8200	3524.54	Ni I	1900	3533.36	Co I	200	3541.63	Ru I	6000 c	3549.72	Tc I
110	3524.72	V II	120	3533.41	Os I	160	3541.77	F II	210	3549.74	Zr I
610	3524.91	Er II	15	3533.45	Sb III	2000 c	3541.77	Tc I	100	3549.82	Yb II
10000	3524.94	Cm I	630	3533.57	U II	280	3541.91	Rh I	820	3549.84	Er II
80 h	3524.97	Ba I	560	3533.68	V I	10000	3542.06	Cm I	10	3549.86	Xe I
240	3524.98	Mo I	600	3534.05	Ce II	250	3542.075	Fe I	240	3549.89	Re I
380	3525.14	Tb II	320	3534.33	U I	150	3542.15	Eu II	4400	3550.22	Dy II
440	3525.61	Tb II	100	3534.63	Ac II	320	3542.17	Mo I	300	3550.45	Nb I
440	3525.81	Zr II	120	3534.82	Re I	10000 s	3542.19	Bk II	630	3550.46	Zr I
800	3525.83	Tc I	250	3534.85	Tm II	50	3542.3	Xe III	120	3550.64	Cr I
9	3525.94	Si III	150	3534.88	Tc I	1700	3542.33	Dy II	4000 c	3550.64	Tc I
120	3526.04	Os I	4400	3534.96	Dy II	320	3542.57	U I	1200	3550.82	U II
400	3526.040	Fe I	7	3535.04	Mg II	50	3542.61	Ag I	300	3550.87	Yb III
100	3526.166	Fe I	210	3535.16	Zr I	630	3542.62	Zr II	310 d	3551.03	Tb
300	3526.18	Tc I	2000	3535.30	Nb I	230	3542.71	Os I	300	3551.08	Br III
60	3526.237	Fe I	310	3535.41	Ti II	540	3542.77	Gd II	160	3551.29	Re I
2	3526.24	Co III	500	3535.51	Tc I	120	3542.85	Ne II	140	3551.401	Th I
60	3526.381	Fe I	1700	3535.52	Tm II	290	3543.35	Nd II	55	3551.53	Ni I
60	3526.467	Fe I	980	3535.54	Hf II	110	3543.50	V I	2200	3551.62	Dy II
70	3526.633	Th I	160	3535.54	W I	360	3543.6	Se III	130	3551.80	Y I
210	3526.68	Ce II	270	3535.65	Sm II	85	3543.85	Eu II	1800	3551.95	Zr II
6400	3526.85	Co I	100	3535.69	Cd II	810	3543.89	Tb II	320	3551.96	Tb II
160	3526.85	W I	10000 l	3535.73	Bk I	1200	3543.95	Rh I	50	3552.1	Xe III
500	3526.90	I II	2700	3535.73	Sc II	180	3544.018	Th I	320	3552.17	U II
400	3527.03	Al IV	40	3535.92	Co II	500	3544.02	Nb I	50	3552.19	Te II
200	3527.53	Nd II	5500	3536.02	Dy II	50000	3544.07	Ce III	100	3552.45	Ba II
110	3527.98	Ni I	490	3536.21	Tm II	400	3544.20	Dy II	180	3552.52	Eu II
8800	3528.02	Rh I	440	3536.32	Tb II	400	3544.35	Dy II	540	3552.69	Y I
430	3528.54	Gd II	200	3536.556	Fe I	250	3544.65	Nb I	540	3552.70	Hf II
1200	3528.60	Os I	850	3536.58	Tm II	80 h	3544.66	Ba I	240	3552.73	Ce II
200	3528.68	Ru I	760	3536.62	Hf I	50	3545.03	Co II	12000	3553.08	Pd I
10000	3528.72	Bk I	150	3536.87	F II	560	3545.20	V II	310	3553.20	Er II
2700	3529.03	Co I	640	3537.28	Mo I	650	3545.22	W I	110	3553.27	V I
100	3529.24	Ac II	160	3537.45	W I	70	3545.596	Ar II	8	3553.37	Mg II
200	3529.29	Tm III	320	3537.46	Re I	210	3545.60	Ce II	30	3553.57	Au I
5000	3529.43	Tl I	100	3537.47	Tm III	3	3545.61	Au I	10000	3553.60	Bk I
230	3529.74	V I	1300	3537.48	Nb I	50	3545.72	Yb II	160	3553.65	Re I
7300	3529.81	Co I	7	3537.57	Sn II	4300	3545.80	Gd II	80	3553.739	Fe I
100	3529.83	Tc I	18	3537.77	Ca III	70	3545.845	Ar II	150	3554.00	Hf I
900	3530.03	Cl III	420	3537.91	Tm I	45	3546.01	Y II	10	3554.04	Xe I
230	3530.06	Os I	570	3537.94	Tb II	1600	3546.05	Ho II	240	3554.15	Sm II
1	3530.17	Pb III	390	3537.95	Ru I	290	3546.19	Ce II	60	3554.19	Ge IV
2000	3530.38	Cu I	65	3538.08	Eu II	200	3546.81	Pm I	7	3554.306	Ar I
310	3530.60	Sm II	300	3538.12	Tc I	1400	3546.83	Dy II	4800	3554.43	Lu II
3000 s	3530.65	Pa II	880 d	3538.14	Rh I	4	3546.90	I IV	250	3554.52	Nb I
7	3530.75	K II		3538.26	Rh I	3	3546.92	I III	1000	3554.66	Nb I
230	3530.77	V II	4400	3538.52	Dy II	10000	3547.02	Cm I	400	3554.925	Fe I
100	3530.87	Hf I	800	3538.68	Tc I	190	3547.03	Ti I	200 s	3554.99	Ac II
1000 l	3530.95	Am I	8	3538.86	Mg II	10 h	3547.16	Ag I	10	3555.	Be I
390	3531.11	U II	4	3538.88	Hg III	390	3547.19	U II	420	3555.00	Ce II
75	3531.15	Eu II	770	3539.08	Ce II	20 h	3547.68	Ba I	200	3555.013	Th I
100	3531.23	Hf I	160	3539.33	Re I	1800	3547.68	Zr I	680	3555.32	U I
30 h	3531.35	Ba I	400	3539.37	Dy II	1300	3547.80	Mn I	200	3555.77	Nd II
10000 l	3531.40	Bk I	790	3539.37	Ru I	10000	3547.92	Cm I	210	3555.82	Tm I
140	3531.450	Th I	670	3539.587	Th II	1100	3548.03	Mn I	10000 s	3555.88	Bk I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
20	3555.93	Co II	270	3563.33	O IV	240	3570.65	Mo I	830	3577.98	Dy II
10000	3556.52	Bk I	110	3563.375	Th I	100	3570.65	Tc I	310	3578.24	Er I
200	3556.546	P III	100	3563.42	Tm III	240	3570.65	W I	390	3578.36	Gd II
2100	3556.60	Zr II	630	3563.50	Nb I	920	3570.75	Er II	19000	3578.69	Cr I
1100 c	3556.78	Ho II	630	3563.62	Nb I	4500	3571.16	Pd I	630	3578.72	U II
560	3556.80	V II	390	3563.66	U I	190	3571.43	Y I	810	3579.12	Ho I
200	3556.878	Fe I	560	3563.69	Dy II	3000	3571.82	Pa I	360	3579.12	Re I
10 h	3557.01	Ag I	420	3563.88	Tm I	990	3571.87	Ni I	1100	3579.20	Tb II
1400	3557.05	Gd II	50 h	3563.94	Yb II	690	3571.93	Gd II	80 h	3579.67	Ba I
160	3557.17	Ir I	200	3564.05	Gd II	120	3571.996	Fe I	100	3579.7	Xe III
5	3557.24	Hg III	240	3564.13	Rh I	320	3572.07	Tb II		3579.8	Li I
300	3557.36	Au I	100	3564.23	Kr III	2100	3572.47	Zr II	150	3579.90	Hf I
420	3557.79	Tm II	150	3564.31	Hf I	80	3572.48	W II	440	3580.04	Dy II
120	3557.80	Ne II	100	3565.11	Cs II	50	3572.50	Yb II	1000	3580.06	Tc I
1500	3558.02	Er I	310	3565.17	Er I	13000	3572.53	Sc II	150	3580.10	Pm II
520	3558.10	Mo I	100	3565.22	Tc I	35000	3572.729	Pb I	810 c	3580.15	Re II
540	3558.19	Gd II	200	3565.31	Pm II	10000	3572.95	Cm II	5000	3580.27	Nb I
10	3558.22	Au I	1000	3565.379	Fe I	210	3573.08	Zr II	1000	3580.52	Er II
440 h	3558.23	Dy II	10000	3565.41	Bk	410 c	3573.24	Ho II	410	3580.75	Ho II
430	3558.47	Gd II	1000 s	3565.59	Ac II	100	3573.393	Fe I	390	3580.94	Sm II
400	3558.515	Fe I	570	3565.74	Tb	130	3573.64	Cr I	7700	3580.94	Sc II
80	3558.52	Cr I	490	3565.91	Tm II	1200	3573.72	Ir I	650	3580.97	Re I
6600	3558.55	Sc II	30	3565.97	Au I	120	3573.74	Ti II	80	3581.19	Ga III
510	3558.71	Er I	300	3566.05	Mo I	60	3573.829	Fe I	4000	3581.19	Fe I
170	3558.76	Y I	1100	3566.10	Zr I	780	3573.83	Dy II	600	3581.26	Tc I
460 d	3558.77	Tb	130	3566.16	Cr I	320	3573.88	Mo I	10	3581.39	Ti IV
160	3558.94	Re I	110	3566.18	V I	60	3573.888	Fe I	25	3581.608	Ar II
320	3558.99	Ir I	40	3566.25	Sb III	80	3574.04	Cr I	410	3581.83	Ho II
35	3559.03	Yb I	5000	3566.37	Ni I	280	3574.06	Tm II	360	3581.84	U II
510	3559.10	Sm II	9	3566.43	Sr IV	120	3574.08	Os I	1400	3581.89	Mo I
40	3559.18	Sb III	1300	3566.47	Tm II	1400	3574.15	Dy II	980	3581.91	Gd II
440	3559.30	Dy II	2300	3566.59	U I	100	3574.18	Ne II	800	3582.08	Tc I
100	3559.43	Pm II	220	3566.84	Sm II	60	3574.24	Ti I	150	3582.199	Fe I
530	3559.451	Th II	20	3566.98	Co II	200	3574.43	La I	50	3582.355	Ar II
100	3559.508	Ar II	10000 l	3567.25	Bk II	200	3574.58	Ru I	3	3582.39	Sn II
300	3559.75	Tc I	810	3567.35	Tb II	50	3574.58	Yb II	2000	3582.63	Tc I
960	3559.79	Os I	270	3567.36	Hf I	200	3574.61	Ne II	810	3583.02	Re I
100	3559.80	Cs II	420	3567.36	Tm I	330	3574.74	Gd II	4700	3583.10	Rh I
1000	3559.90	Er II	5	3567.67	Tl II	320	3574.76	U I	100	3583.101	Th I
410	3560.15	Ho II	6100	3567.70	Sc II	330 h	3574.80	Cr I	110	3583.28	Hf I
800	3560.32	Tc I	200	3567.73	Ba II	630 c	3574.80	Ho II	310	3583.39	Sm II
200	3560.33	Yb II	4800	3567.84	Lu I		3574.94	Cr I	120	3583.53	Rh I
230	3560.39	O IV	160	3568.04	W I	50	3574.95	Co II	80	3583.6	Xe III
800	3560.68	Cl III	160	3568.23	Re I	1600	3574.96	Co I	2	3583.60	Ga II
9	3560.68	Tl II	4200	3568.27	Sm II	160	3575.22	W I	200	3584.21	Pr II
170	3560.70	Yb II	250	3568.50	Ne II	60	3575.32	Co II	160 h	3584.33	Cr I
410	3560.75	Nd II	4200	3568.52	Tb II	2500	3575.36	Co I	30 h	3584.37	Au I
1200	3560.80	Ce II	800	3568.85	Tc I	100	3575.42	Tc I	400	3584.42	Dy II
1200	3560.86	Os I	340	3568.87	Nd II	11	3575.45	Sn II	3300	3584.52	Y II
1100	3560.89	Co I	210	3568.88	Zr I	1100	3575.79	Zr I	150	3584.660	Fe I
340	3560.92	Tm I	1600	3568.98	Tb II	1500	3575.85	Nb I	3200	3584.88	U I
100	3561.030	Ar II	1100	3569.04	Hf II	260	3576.05	Y I	120	3584.929	Fe I
80	3561.07	Co II	530	3569.08	U I	210	3576.23	Ce II	5400	3584.96	Gd II
100	3561.20	Ne II	5000	3569.16	Am I	4400	3576.24	Dy II	500	3584.97	Nb I
40	3561.4	Xe III	8800	3569.38	Co I	100	3576.28	Ba II	710	3585.03	Tb II
320	3561.41	U I	2200	3569.49	Mn I	9900	3576.35	Sc II	3300	3585.06	Dy II
10000	3561.44	Cm I	8	3569.67	Si III	17	3576.44	Ti IV	1000	3585.16	Co I
1300	3561.66	Hf II	310	3569.78	Os I	200	3576.557	Th I	130	3585.30	Cr II
3200	3561.74	Tb II	720	3569.80	Mn I	70	3576.616	Ar II	300	3585.319	Fe I
65	3561.75	Ni I	70	3569.820	Th I	1300	3576.85	Zr II	360	3585.47	Yb II
1200	3561.80	U I		3570.04	Mn I	1700	3576.87	Dy II	150	3585.705	Fe I
5	3562.32	In III	1200	3570.097	Fe I	1000	3577.45	Ce II	1400	3585.78	Dy II
120	3562.34	Os I	1200	3570.18	Rh I	200	3577.526	P III	10000	3585.87	Pu II
300	3562.41	Tm III	285	3570.2	Se III	30	3577.62	Ba I	10	3586.04	Fe III
500	3562.43	Br III	800	3570.25	Fe I	200	3577.72	Nb I	280	3586.07	Tm I
200 s	3562.68	Am II	240	3570.26	Re I	270	3577.79	Sm II	200	3586.103	Fe I
480	3562.90	Tb II	3000	3570.56	Pa I	1400	3577.88	Mn I	560	3586.11	Dy II
400	3563.14	Mo I	85	3570.57	Yb II	360	3577.92	U I	880	3586.29	Zr I
2200	3563.15	Dy II	690	3570.59	Ru I	60	3577.96	Co II	720	3586.54	Mn I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
450	3586.56	Al II	320	3594.39	Ir I	270	3602.94	Mo I	10000	3611.03	Bk
370	3586.60	Er I	300	3594.57	Tc I	10000 s	3603.20	Bk II	7800	3611.05	Y II
20 h	3586.67	Ag I	100	3594.633	Fe I	150	3603.20	Eu II	70	3611.30	Yb II
300	3586.73	Au I	1900	3594.87	Co I	150	3603.204	Fe I	320	3611.33	Tb II
400	3586.984	Fe I	1800	3595.04	Dy II	500	3603.41	Am I	75	3611.57	Eu II
100	3587.05	Rb I	290	3595.12	Mn I	85	3603.74	Cr I	100	3611.57	Au I
360	3587.07	Al II	100 w	3595.4	Xe III		3603.78	Cr II	100	3611.78	Te II
60	3587.13	Ti II	1000 c	3595.66	Tc I	11	3603.88	Fe III	690	3611.89	Zr II
6700	3587.19	Co I	410	3595.84	Er I	1700	3604.28	Sm II	10000 l	3611.93	Bk
390	3587.20	Ru I	10000	3595.88	Bk I	95	3604.48	Os II	130	3611.94	Pr II
1	3587.27	He I	240	3596.05	Ti II	10000	3604.78	Bk	60	3612.068	Fe I
120	3587.32	Os I	400	3596.06	Dy II	1100	3604.87	Gd I	10000	3612.11	Cf II
570	3587.44	Tb II	100 s	3596.07	Am II	510	3604.90	Er II	750	3612.36	Al III
290	3587.45	Al II	380 c	3596.11	Bi I	320	3604.90	Tb II	200	3612.427	Th I
470	3587.51	Nd II	6400	3596.18	Ru I	270	3605.26	Gd II	3100	3612.47	Rh I
200	3587.74	Tm III	4700	3596.19	Rh I	460	3605.27	U I	70	3612.61	Cr I
300	3587.75	Y I	340	3596.34	Lu I	10000	3605.32	Cf I	530	3612.74	Ni I
130	3587.93	Ni I	810	3596.38	Tb II	13000	3605.33	Cr I	800	3612.85	Cl III
4000	3587.94	Tc I	160	3596.39	Re I	200	3605.454	Fe I	800	3612.873	Cd I
440	3587.98	Zr II	200	3596.57	Ba II	250	3605.66	Gd II	8	3613.06	Xe I
400	3588.33	Po	5900	3597.15	Rh I	310	3605.86	Rh I	1100	3613.10	Zr II
70	3588.441	Ar II	210	3597.42	Hf II	240	3606.06	W I	340	3613.31	Ho II
30 h	3588.79	Au I	1300	3597.70	Ni I	100	3606.06	Xe III	540	3613.39	Gd II
750	3589.11	Nb I	340	3598.02	Nd II	1800	3606.12	Dy II	45	3613.4	Bi III
6400	3589.22	Ru I	30	3598.06	Au I	360	3606.32	U II	3	3613.64	He I
75	3589.27	Eu I	440	3598.06	Tb II	130	3606.48	Yb II	420	3613.70	Ce II
100	3589.34	Ga III	620	3598.11	Os I	7	3606.522	Ar I	80	3613.79	W II
500	3589.36	Nb I	270	3598.120	Th I	500	3606.680	Fe I	3	3613.81	I III
4000	3589.64	Sc II	170	3598.69	F II	110	3606.69	V I	28000	3613.84	Sc II
100	3589.69	Y I	190	3598.72	Ti I	300 h	3606.80	Br II	200	3613.89	Yb III
170	3589.750	Th I	10000	3598.77	Cf I	40	3607.0	Xe III	10000	3613.91	Bk
560	3589.76	V II	1100cw	3598.77	Ho II	1000 c	3607.32	Tc I	30 h	3614.00	Au I
7	3589.87	Pb III	210	3598.88	Mo I	750	3607.41	Ta I	270 d	3614.21	Gd II
360	3590.07	Dy II	1400	3599.13	Cu I	410	3607.42	Er I		3614.42	Gd I
10000	3590.32	Bk I	340	3599.48	Ho I	420	3607.54	Mn I	60	3614.453	Cd I
540	3590.47	Gd II	610	3599.50	Er II	200	3607.62	Tc I	320	3614.63	Tb II
20	3590.47	Si III	1300	3599.76	Ru I	390	3607.63	Ce II	1100	3614.77	Zr II
4000	3590.48	Sc II	1000	3599.83	Er II	100 h	3607.88	Kr II	240	3614.78	Rh I
320	3590.50	U II	540	3599.87	Hf I	2000 c	3608.27	Tc I	110	3615.04	Hf I
160	3590.52	F II	15	3600.169	Ne I	210	3608.37	Mo I	480	3615.133	Th II
330	3590.60	Ce II	560	3600.38	Dy II	170	3608.377	Th I	85	3615.64	Cr I
200	3590.74	Mo I	1600	3600.44	Tb II	40	3608.40	Cr I	320 d	3615.66	Tb II
610	3590.76	Er I	5000	3600.60	Rb II	10000 l	3608.49	Bk	370	3615.82	Nd II
45	3591.31	Eu II	10000	3600.62	Cm I	420	3608.49	Mn I	100 w	3615.9	Xe III
1100	3591.41	Dy II	10000	3600.64	Rb II	830	3608.75	Gd II	100	3616.00	Mn III
40	3591.57	Rb I	450	3600.71	Br III	2100	3608.77	Tm II	45	3616.15	Eu II
390	3591.74	U I	10000	3600.73	Y II	1500	3608.859	Fe I	320	3616.33	U I
560	3591.81	Dy II	300	3600.91	Nd II	5	3608.88	K II	3100	3616.56	Er II
490	3592.02	V II	11	3600.94	Fe III	980	3609.445	Th II	250	3616.57	Os I
560	3592.11	Dy II	540 c	3600.95	Ho II	40	3609.48	Cr I	320	3616.58	Tb II
630 c	3592.23	Ho II	540	3600.96	Gd II	3400	3609.49	Sm II	10000	3616.62	Bk
80	3592.42	W II	390	3601.034	Th II	250	3609.53	Tm II	320	3616.76	U II
560	3592.53	V I	10000	3601.12	Bk I	20000	3609.55	Pd I	800	3616.89	Hf I
300	3592.59	Nd II	3500	3601.19	Zr I	10000	3609.61	Bk	320	3617.08	Re I
4200	3592.60	Sm II	180	3601.39	F II	550	3609.69	Ce II	400	3617.118	Th II
1100	3592.71	Gd II	870	3601.63	Al III	220	3609.77	Ir I	430	3617.16	Gd II
270	3592.780	Th I	350	3601.67	Cr I	320	3609.79	Nd II	190	3617.21	Ir I
2800	3592.92	Y I	340	3601.69	Sm II	40	3610.05	Cr I	110	3617.43	Sc I
8	3592.96	Er III	150	3601.72	Mn III	250	3610.16	Fe I	10000	3617.49	Cf I
6900	3593.02	Ru I	190	3601.83	Os I	600	3610.16	Ti I	1900	3617.52	W I
270	3593.33	V II	6200	3601.92	Y II	50	3610.23	Yb II	50	3617.57	Te II
200	3593.44	Gd II	550	3601.93	Al III	360	3610.30	Mn I	110	3617.68	Hf I
200	3593.47	Tc I	1400	3602.03	Cu I	15	3610.32	Xe I	150	3617.788	Fe I
17000	3593.49	Cr I	1600	3602.08	Co I	1300	3610.46	Ni I	510	3617.85	Er II
460	3593.52	U II	900	3602.10	Cl III	160	3610.49	Re I	380	3617.86	Tb II
50	3593.526	Ne I	500	3602.56	Nb I	1000	3610.508	Cd I	600	3617.96	Tm III
30	3593.640	Ne I	40	3602.57	Cr I	830	3610.76	Gd II	15	3617.97	V V
500	3593.97	Nb I	360	3602.82	Dy II	200	3610.76	Pm II		3618.	Li I
6	3594.10	F I	190	3602.84	F II	220	3610.91	Gd II	3000	3618.07	Pa I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
410	3618.43	Ho I	430 c	3626.69	Ho II	28	3635.14	Mo II	170 d	3641.53	La I
6	3618.49	K II	370	3626.74	Ru I	3000 c	3635.15	Tc I		3641.66	La II
440	3618.51	Dy II	10000 s	3626.76	Cf II	95	3635.20	Ti I	670	3641.66	Tb II
1500	3618.768	Fe I	850	3627.01	Sm II	400	3635.27	Dy II	220	3641.83	Cr I
510	3618.92	Er II	130	3627.24	W I	100	3635.43	Hf I	500	3642.06	Ta I
200	3618.94	Tc I	490	3627.25	Ho II	1000	3635.43	Mo I	210	3642.248	Th I
300	3618.96	Nd II	1000 c	3627.36	Tc I	4800	3635.46	Ti I	6600	3642.68	Ti I
290	3619.28	Mn I	10000	3627.61	Bk I	270	3635.943	Th I	13000	3642.79	Sc II
10000	3619.37	Bk	95	3627.80	Rh I	10000 c	3636.07	Tc I	100	3643.	Bi IV
6600	3619.39	Ni I	1000	3627.81	Co I	220	3636.20	Ir I	70	3643.17	Pt I
120	3619.43	Os I	720	3628.04	Er I	680	3636.25	Lu I	80	3643.61	Co II
300	3619.51	Nb II	120	3628.11	Pt I	1	3636.31	Co III	950	3643.65	Tm II
380	3619.73	Tb II	660	3628.67	Ir I	10000	3636.52	Pa I	80	3643.717	Fe I
200	3619.80	Yb II	1900	3628.71	Y II	350	3636.59	Cr I	400	3643.92	Dy II
2	3620.08	Sn II	320	3628.83	La II	40 h	3636.83	Ba I	150	3643.93	Ne II
320	3620.08	U I	1000	3629.09	Tm III	240	3637.00	Nd II	420	3644.24	U I
560	3620.16	Dy II	310	3629.37	Er I	10000 l	3637.05	Bk I	800	3644.36	Hf II
390	3620.46	Gd II	1100	3629.42	Dy II	140	3637.06	Re I	20	3644.41	Ca I
200	3620.46	Rh I	380	3629.44	Tb II	120	3637.15	La II	40	3644.46	Te II
6	3620.54	Sn II	250	3629.51	Gd II	240	3637.23	Nd II	110	3644.71	V I
240	3620.58	Sm II	140	3629.74	Mn I	360	3637.28	Dy II	14	3644.77	Ca I
4300	3620.94	Y I	200	3629.84	Pm II	210	3637.47	Ru I	8	3644.99	Ca I
200	3621.03	Nb I	4000	3630.24	Dy II	450	3637.6	Se III	100 h	3645.02	Au I
100	3621.21	Co II	200	3630.39	Tc I	240	3637.76	Yb II	310	3645.03	U II
1700	3621.23	Sm II	40	3630.64	Ba I	25	3637.80	Sb II	6 h	3645.12	Si III
160	3621.46	Re I	460	3630.73	U II	250	3637.83	Sb I	360	3645.29	Sm II
200	3621.462	Fe I	17	3630.75	Ca I	810	3637.84	Re I	6600	3645.31	Sc II
10000 s	3621.81	Bk	20000	3630.75	Sc II	300	3637.90	Au I	300	3645.39	Sm II
150	3622.004	Fe I	320	3630.87	Hf II	120	3637.97	Ti I	11000	3645.40	Dy II
25	3622.138	Ar II	170	3630.96	Pr II	840	3638.20	U I	1000	3645.42	La II
440	3622.15	Ce II	14	3630.97	Ca I	1000	3638.22	Tc I	100	3645.55	Pr II
160	3622.34	W I	300	3631.02	Nd II	100	3638.298	Fe I	870	3645.62	Gd II
95	3622.54	Eu II	100	3631.096	Fe I	430 c	3638.30	Ho II	250	3645.66	Pr II
8 h	3622.54	Si III	850	3631.13	Sm II	380	3638.41	Tm I	240	3645.78	Nd II
700	3622.69	Cl III	200	3631.19	Ce II	670	3638.46	Tb II	360	3645.86	Dy II
320	3622.70	U I	1200	3631.27	Na II	70	3638.644	Th I	900	3645.94	Er II
30	3622.74	Au I	100 h	3631.31	Au I	1600	3638.68	Er I	45	3646.16	Cr I
390	3623.06	U II	1200	3631.463	Fe I	410	3638.77	Sm II	6100	3646.19	Gd II
40	3623.1	Xe III	430 c	3631.76	Ho II	70	3638.79	Pt I	180	3646.20	Ti I
150	3623.19	Fe I	200	3631.889	Kr II	200	3638.85	Tc I	400 c	3646.26	Rb II
200	3623.23	Mo I	320	3631.94	W I	110	3639.02	V I	250	3646.30	Pr II
240	3623.32	Sm II	160	3632.0	S III	220	3639.05	Gd II	80	3646.52	W II
10 h	3623.49	Ag I	60	3632.041	Fe I	200	3639.33	Nb I	110	3646.90	Sc I
380	3623.74	Ce II	95	3632.18	Eu II	900	3639.38	Tc I	350	3646.97	Ce II
220	3623.79	Mn I	10000	3632.21	Pu II	100	3639.42	Cu III	440	3647.06	Tb II
440	3623.84	Ce II	440	3632.78	Dy II	5 h	3639.45	Si III	350 c	3647.56	Rb II
1100	3623.86	Zr I	140	3632.831	Th I	310	3639.51	Rh I	240	3647.72	Tm II
270	3623.970	Th II	130	3632.84	Cr I	50000 r	3639.568	Pb I	260	3647.75	Ce II
800	3623.99	Lu II	6	3633.06	Xe I	630	3639.80	Cr I	570	3647.75	Tb II
110	3624.00	Hf II	7800	3633.12	Y II	600 c	3639.80	Rb II	2600	3647.77	Lu I
600	3624.08	Xe III	10	3633.22	Au II	20	3639.833	Ar II	1500	3647.842	Fe I
15	3624.11	Ca I	10000	3633.28	Bk	3	3639.87	Au I	260	3647.95	Ce II
470	3624.27	Dy II	670	3633.29	Tb II	10000	3639.94	Cm I	1000 c	3648.04	Tc I
1400	3624.46	Mo I	1000	3633.54	Er II	250	3640.18	Gd II	70	3648.15	Yb I
50 h	3624.68	Ag I	20	3633.665	Ne I	400	3640.23	Tc I	340	3648.20	Nd II
130	3624.73	Ni I	320	3634.15	Zr I	240	3640.24	Nd II	100	3648.30	Pr II
190	3624.82	Ti II	300	3634.20	Pm II	1100	3640.25	Dy II	85	3648.53	Cr I
270	3624.89	Gd II	1	3634.21	Co III	10000	3640.26	Bk I	1000	3648.78	Dy II
450	3624.90	Gd III	2	3634.23	He I	450	3640.33	Os I	3	3648.84	K I
350	3625.20	Ru I	3400	3634.29	Sm II	200	3640.389	Fe I	4	3648.98	K I
810	3625.54	Tb II	340	3634.30	Nd II	85	3640.39	Cr I	220	3649.00	Cr I
390	3625.627	Th II	110	3634.52	Yb	200	3640.64	Ru I	10	3649.09	Au I
160	3625.91	Re I	30	3634.53	Au I	310	3640.76	U II	320	3649.10	Hf I
330	3626.18	Mo I	510	3634.67	Er I	10000 s	3640.93	Bk II	25	3649.18	Ba III
160	3626.29	Ir I	20000	3634.70	Pd I	190	3641.33	Ti II	310	3649.44	Gd II
4	3626.42	K II	330	3634.76	Gd II	30	3641.34	Kr III	240	3649.46	Nd
570	3626.50	Tb II	240	3634.93	Sm II	330	3641.39	Gd II	250	3649.506	Fe I
1800	3626.59	Rh I	3100	3634.93	Ru I	240	3641.41	W II	660	3649.53	Sm II
980	3626.62	Ta I	10	3635.12	Au I	70	3641.47	Cr I	100	3649.55	Ra II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
20	3649.558	Cd I	1000 c	3658.59	Tc I	120	3666.31	Os I	800	3674.72	Zr II
170	3649.735	Th I	50	3658.808	Th I	290	3666.54	Sc II	140	3674.76	Rh I
420	3649.85	Nb I	2000	3658.88	Tb II	95	3666.64	Cr I	450 c	3674.77	Ho II
2800	3650.15	Hg I	960	3659.15	U I	720	3666.65	Ho I	270	3674.78	Nb I
2800	3650.157	Hg I	440	3659.23	Ce II	290	3666.72	Mo I	200	3674.85	Pm I
390	3650.18	La II	300	3659.39	Pm II	350	3666.72	Rb II	320	3674.98	Ir I
340	3650.19	Sm II	10000	3659.46	Cf	400	3666.84	Dy I	140	3675.08	Yb II
80	3650.279	Fe I	200	3659.61	Nb II	180	3666.91	Rh I	55	3675.26	Sc II
290	3650.32	Ru I	100	3659.629	Th I	2	3667.52	Co III	5	3675.29	Ca I
2000	3650.40	La IV	120	3659.76	Ti II	250	3667.74	V I	120	3675.45	Os I
2300	3650.40	Tb II	30	3659.84	Yb III	340	3667.93	Sm II	160	3675.55	W I
520	3650.41	Er II	350	3659.97	Ce II	1400	3667.97	Ho I	700	3675.567	Th II
240	3650.42	Nd II	150 c	3660.36	Pr II	880	3667.98	Ce II	10000 l	3675.59	Bk I
100	3650.74	Au I	630	3660.37	Nb I	55	3668.03	Cr I	300	3675.66	Rb II
250	3650.81	Nb I	100	3660.40	Mn I	1100	3668.09	Tm II	280	3675.70	V I
450	3650.95	Gd II	380	3660.63	Ti I	140	3668.140	Th I	480	3675.74	Hf I
220	3651.06	Al II	880	3660.64	Ce II	12	3668.17	F I	20	3675.78	Yb III
15	3651.07	Cs II	140	3661.05	Hf II	100	3668.21	Hf I	100	3676.311	Fe I
110	3651.10	Al II	260	3661.20	Zr I	45	3668.49	Y II	65	3676.32	Cr I
400	3651.19	Nb II	6200	3661.35	Ru I	370	3668.83	Pr II	3800	3676.35	Tb II
200	3651.467	Fe I	2200	3661.36	Sm II	380	3668.97	Ti I	2200	3676.59	Dy II
600	3651.47	Tc I	400 c	3661.45	Tc I	150	3669.01	Kr II	50	3676.65	Ge IV
660	3651.54	U I	100	3661.62	Pr II	220	3669.01	Nb I	50	3676.67	Xe III
5300	3651.80	Sc II	300	3661.71	Ir I	470	3669.02	Er II	170	3676.68	V I
200	3651.84	Hf I	280	3661.86	Rh I	320	3669.05	Ho II	70	3676.96	Mn I
440	3651.97	Re I		3662.	Li I	300 r	3669.22	Pm I	2	3677.23	Co III
490	3652.06	U I	70	3662.0	S III	130	3669.24	Ni I	150	3677.629	Fe I
620	3652.54	Gd II	170	3662.08	La II	110	3669.41	V II	40	3677.68	Cr II
360	3652.58	Er II	190	3662.24	Ti II	650	3669.49	Ru I	340	3677.79	Sm II
500	3652.87	Er II	1400	3662.26	Gd II	450	3669.52	Ho I	55	3677.89	Cr II
420	3653.11	Ce II	470	3662.26	Nd II	240	3669.69	Yb II	300	3677.89	Tb II
410	3653.15	Nd II	1600 c	3662.29	Ho I	120	3669.78	Re I	410	3677.98	Tm II
7200	3653.50	Ti I	220	3662.69	Sm II	10	3669.91	Xe I	240	3678.18	Nd II
10	3653.53	Au I	10000	3662.70	Cf I	280	3669.968	Th I	6	3678.21	Ca I
180	3653.58	Pr III	1000 c	3662.74	Rb II	120	3670.024	Fe I	45	3678.26	Eu II
600	3653.61	Tm II	45	3662.84	Cr I	2800	3670.07	U II	240	3678.32	Ru I
660	3653.67	Ce II	80	3662.88	Hg I	150	3670.089	Fe I	40	3678.35	Sc II
170	3653.91	Cr I	80	3662.883	Hg I	700	3670.28	Cl III	640	3678.51	Dy I
250	3653.928	Kr II	430	3662.99	Ho I	180	3670.43	Ni I	200	3678.51	Pm II
240	3654.16	Nd	50	3663.10	Pt I	70	3670.52	Mn I	380	3678.75	U II
12	3654.2	Bi II	450	3663.12	Tb II	320	3670.53	Re I	450 d	3678.85	Tm II
310	3654.40	Ru I	220	3663.202	Th I	340	3670.66	Sm II	1000	3679.15	Tc I
230	3654.49	Os I	130	3663.21	Cr I	50	3670.69	Yb II	720	3679.19	Ho I
290	3654.59	Ti I	240	3663.28	Hg I	2200	3670.84	Sm II	350	3679.21	Gd I
3900	3654.62	Gd II	240	3663.281	Hg I	480	3670.89	Os I	20	3679.26	Te II
3	3654.69	Au I	830	3663.37	Ru I	2000	3671.20	Gd II	220	3679.42	Ce II
300	3654.839	Hg I	250	3663.59	V I	170	3671.20	V I	100	3679.559	Kr I
300	3654.84	Hg I	1100	3663.65	Zr I	390	3671.27	Zr II	670	3679.70	Ho I
350	3654.87	Rh I	30	3663.74	Yb III	200	3671.36	Po	40	3679.82	Cr I
810	3654.88	Tb II	900 c	3663.81	Rb II	20000	3671.491	Pb I	300 r	3679.85	Pm I
310	3654.97	Ce II	200	3664.07	Ne II	600	3671.67	Ti I	100	3679.86	V III
150	3654.98	Al II	200	3664.10	Ni I	80	3671.99	Pt I	1500	3679.913	Fe I
290	3655.00	Al II	110	3664.25	Sc II	220	3672.18	Ce I	15	3680.10	Cs II
10	3655.30	Au I	10000	3664.34	Cm I	200	3672.27	Hf I	300	3680.11	V I
90	3655.73	Yb I	360	3664.45	Er I	990	3672.30	Dy II	300	3680.32	Tc I
40	3655.78	Sn I	2700	3664.60	Gd II	540	3672.36	Nd II	1300	3680.60	Mo I
1800	3655.85	Ce II	3000	3664.61	Y II	420	3672.70	Dy II	3	3680.74	Co III
3100	3656.15	Gd II	700	3664.62	Dy II	350	3672.79	Ce II	560	3681.04	Rh I
340	3656.22	Sm II	300	3664.62	Ir I	590	3672.82	Mo I	10000 s	3681.22	Bk II
220	3656.26	Cr I	900	3664.70	Nb I	5000	3673.12	Am I	60	3681.35	Co II
10	3656.75	Co II	200	3664.74	Yb III	400	3673.14	Dy II	7 h	3681.40	Si III
10	3656.90	Au I	540	3664.81	Mo I	45	3673.19	Eu II	6	3681.54	K II
330	3656.90	Os I	200	3664.92	Tc I	280	3673.40	V I	19	3681.69	Cr I
700	3656.95	Cl III	540	3665.18	Nd II	580	3673.54	Nd II	270	3681.73	Sm II
400	3657.35	Mo I	80	3665.324	Kr I	80	3674.04	Pt I	100	3682.	Bi IV
80	3657.59	W II	220	3665.35	Hf II	1000	3674.05	Gd I	700	3682.05	Cl III
8200	3657.99	Rh I	500	3665.81	Tm II	1400	3674.08	Dy II	650	3682.08	W I
660	3658.10	Ti I	45	3665.98	Cr I	260	3674.15	Ni I	50	3682.09	Mn I
210	3658.19	Gd I	1300	3666.22	Rh I	45	3674.63	Eu II	5 h	3682.15	Si III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
2200	3682.24	Hf I	120	3689.477	Fe I	300	3697.50	Pm II	1800	3704.70	V I
200	3682.242	Fe I	860 c	3689.50	Re I	410	3697.56	Nd II	300	3704.80	Tc I
20	3682.243	Ne I	410	3689.69	Nd II	300 r	3697.63	Pm I	330	3704.85	Tm II
810	3682.26	Tb II	100	3689.71	Pr II	380	3697.68	Er I	100	3704.92	Hf I
75	3682.46	Ag II	100	3689.73	Ta I	100	3697.71	Re I	240	3704.95	Nd II
150	3682.486	Th I	400	3689.79	Pm II	2000	3697.73	Gd II	220	3704.98	Ce II
30	3682.50	Ag I	600	3689.91	Ti I	1500	3697.85	Nb I	3	3705.00	He I
720	3682.65	Ho I	1000	3690.28	V I	150	3698.06	Pr II	100	3705.02	Re I
500	3682.70	Er II	5500	3690.34	Pd I	180	3698.105	Th I	570	3705.04	V I
120	3683.054	Fe I	50	3690.56	Yb II	960	3698.17	Zr II	10000	3705.26	Bk I
570	3683.13	V I	240	3690.59	Mo I	30	3698.18	Ti I	50 h	3705.35	V III
400	3683.30	W I	100	3690.624	Th I	990	3698.21	Dy II	120	3705.40	Hf II
80	3683.34	Ag II	580	3690.65	Ho I	280	3698.26	Rh I	600	3705.45	Cl III
	3683.39	W I	30	3690.65	Kr III	100	3698.40	Hf II	1200	3705.566	Fe I
70000 r	3683.462	Pb I	1900	3690.70	Rh I	60	3698.43	Ti I	320	3705.82	La II
30	3683.70	Ca II	610	3691.15	Tb II	380	3698.60	Rh I	2	3705.85	Ga II
160	3683.93	W I	1500 c	3691.48	Re I	70	3698.60	Yb II	3	3706.02	Pb III
320	3684.01	Er I	540	3691.92	U II	80	3698.70	O III	170	3706.03	Ca II
150	3684.107	Fe I	340	3691.95	Ho I	10000	3699.19	Pu II	210	3706.08	Mn I
2000	3684.13	Gd I	270	3692.22	Sm II	100	3699.48	Cs II	100	3706.11	Tm III
45	3684.22	Mo II	1500	3692.22	V I	10000 s	3699.49	Cf	140	3706.23	Ti II
380	3684.28	Er II	9400	3692.36	Rh I	2500 c	3699.58	Rb II	18	3706.53	Pt I
	3684.32	Li II	300	3692.50	Pm II	240	3699.72	Hf II	30	3706.55	Au II
60	3684.32	Lu I	170	3692.53	Y I	1300	3699.73	Gd II	120	3706.56	Os I
10000 l	3684.43	Bk I	170	3692.566	Th I	35	3699.91	Pt I	200	3706.70	Tc I
100 l	3684.57	Am II	180	3692.64	Mo II	410	3700.04	Ho I	10	3706.74	Mg III
5000	3684.74	Tc I	7900	3692.65	Er II	60	3700.08	Ti I	230	3706.75	Pr II
820	3684.85	Dy I	10000	3692.73	Bk I	450	3700.12	Tb I	480	3706.75	Sm II
430	3685.16	Ho II	300	3692.76	Tc I	4800	3700.26	Tm II	340	3706.767	Th I
3100	3685.20	Ti II	300	3692.95	Tb II	250	3700.47	Gd III	480	3706.98	Sm II
10000 s	3685.21	Bk I	40	3693.49	Xe I	540	3700.57	U II	60	3707.041	Fe I
120	3685.55	Cr I	250	3693.53	Br III	70	3700.58	Yb I	110	3707.24	O III
12	3685.736	Ne I	450	3693.58	Tb I	540	3700.72	Er II	600	3707.34	Cl III
1300	3685.78	Dy I	280	3693.67	Mn I	7600	3700.91	Rh I	330	3707.40	Dy II
1200	3685.80	Nd II	330	3693.70	U II	150	3701.086	Fe I	50	3707.53	Ti I
40	3685.90	Xe I	180 c	3693.91	In II	340	3701.15	Hf II	440	3707.57	Dy II
120	3685.96	Ti I	1	3693.93	Ga II	10	3701.225	Ne I	200	3707.63	Tc I
120	3685.998	Fe I	80	3693.93	Ni I	3800	3701.36	Tm II	520	3707.64	Er II
100	3686.18	Ta I	1100	3693.99	Sm II	30	3701.432	Hg I	150	3707.821	Fe I
80	3686.182	Kr II	150	3694.008	Fe I	30	3701.44	Hg I	100 l	3707.86	Am II
190	3686.26	V I	210	3694.03	Gd II	1100	3701.52	U II	300	3707.919	Fe I
720	3686.33	Gd II	40	3694.11	Ca II	540	3701.63	Dy II	810	3707.92	W I
1000	3686.555	Cu II	32000	3694.19	Yb II	70	3701.73	Mn I	95 c	3708.13	In II
10000 l	3686.74	Bk I	200	3694.21	Ne II	220	3702.03	Mo I	440	3708.22	Dy II
130	3686.80	Cr I	10	3694.36	Ca II	450	3702.11	Al III	200	3708.26	Tc I
250	3687.03	Pr II	140	3694.45	Ti I	120	3702.29	Ti I	480	3708.41	Sm II
200	3687.08	Ir I	410	3694.74	Tm II	490 c	3702.35	Ho II	930	3708.65	Sm II
150	3687.19	Pr II	4700	3694.81	Dy II	400	3702.63	Pm II	130	3708.72	V I
130	3687.25	Cr I	300	3694.81	Nd II	3000	3702.74	Pa I	120	3709.14	Os I
440	3687.30	Nd II	100	3694.88	Ac II	80	3702.75	O III	50 h	3709.20	Ag I
95	3687.35	Ti I	300	3694.91	Ce II	240	3702.84	Nd	600	3709.246	Fe I
500	3687.456	Fe I	1400	3694.94	Mo I	4700	3702.86	Tb II	720	3709.26	Zr II
470	3687.47	V I	60	3694.95	Rh I	500	3702.92	Cu III	1000	3709.29	Ce II
75	3687.54	Cr I	120	3695.051	Fe I	300	3703.12	Tb I	370	3709.30	Tb II
15	3687.64	Cs II	50	3695.32	Bi III	50	3703.229	Th I	110	3709.4	S III
200	3687.65	Pm II	5	3695.32	Co II	520	3703.24	Re I	10000	3709.43	Cm I
3100	3687.74	Gd II	450	3695.34	V I	190	3703.25	Os I	100	3709.62	Au I
570	3688.06	W I	10000	3695.37	Bk I	10000	3703.28	Bk I	150	3709.62	Ne II
1300	3688.07	V I	940	3695.52	Rh I	80	3703.37	O III	320	3709.76	Ho I
320	3688.15	Tb II	50	3695.68	Bi III	3800	3703.58	V I	1000	3709.93	Ce II
65	3688.31	Mo II	1000	3695.86	V I	800	3703.83	Tc I	240	3709.93	Re I
6400	3688.42	Eu II	450	3696.25	Er II	2400	3703.92	Tb II	290	3709.96	Ti I
160	3688.42	Ni I	1000 s	3696.42	Am II	10000 s	3704.02	Bk I	420	3710.07	Dy II
270	3688.42	Sm II	280	3696.51	Hf I	35	3704.17	Hg I	13000	3710.30	Y II
19	3688.46	Cr I	180	3696.57	Mn I	35	3704.170	Hg I	50	3710.34	Yb II
20 h	3688.47	Ba I	260	3696.59	Ru I	190	3704.30	Ti I	160	3710.35	F II
50	3688.658	Th I	320	3696.85	Tb II	80	3704.462	Fe I	60	3710.87	Eu II
250	3689.06	Os I	370	3697.31	Dy II	180	3704.53	F II	60	3710.95	Lu I
7	3689.31	Pb III	390	3697.46	Zr II	120	3704.54	La I	850	3711.07	Na II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
170 c	3711.10	Pr II	410	3717.00	Ru I	410	3724.87	Nd II	360	3732.09	Ho I
10000 s	3711.14	Bk II	75 h	3717.10	Sc I	420	3724.90	Sm II	21	3732.20	Eu I
280	3711.305	Th II	360 c	3717.28	Re I	20000cw	3724.94	Eu II	140	3732.28	Re I
330	3711.34	Nb I	450	3717.40	Ti I	16	3724.94	Rh I	270	3732.32	Gd I
480	3711.54	Sm II	300	3717.42	U II	890	3725.06	Tm II	10000	3732.35	Cm I
330	3711.66	Dy II	2000	3717.48	Gd I	380	3725.16	Ti I	430	3732.39	Tb II
360	3711.7	Se III	35	3717.69	Eu II	140	3725.38	Ir I	150	3732.396	Fe I
800	3711.72	Pm II	160	3717.8	S III	10000	3725.39	Bk I	230	3732.45	Gd II
1000 d	3711.76	Tb II	1000	3717.80	Hf I	430	3725.47	Gd II	15	3732.54	Cs II
400	3711.91	Yb III	7700	3717.91	Tm I	60	3725.491	Fe I	350	3732.62	U II
1000	3712.26	Tc I	300 h	3718.02	Kr II	30	3725.66	Te II	230	3732.67	Gd I
520	3712.39	Er II	350	3718.11	U II	420	3725.68	Ce II	330 d	3732.71	Mo I
2700	3712.70	Gd II	60	3718.12	Y I	4000	3725.76	Re I	280	3732.76	V II
220	3712.75	O II	420	3718.19	Ce II	315 w	3725.93	O IV	270	3732.78	Nd II
350	3712.76	Sm II	35	3718.206	Ar II	10000	3725.98	Pu I	1	3732.86	He I
200	3712.81	Nd	120 c	3718.30	In II	500	3726.01	Pm I	120 c	3733.03	Pr II
300	3712.82	Tc I	420	3718.38	Ce II	550	3726.10	Ru I	350	3733.07	U II
430	3712.88	Ho I	410	3718.54	Nd II	10000	3726.11	Pu II	510	3733.08	Gd II
10000	3712.93	Bk I	200	3718.595	Kr II	2700	3726.24	Nb I	1200	3733.317	Fe I
75	3712.95	Cr II	3	3718.7	Li I	5000	3726.35	Tc I	200	3733.393	P IV
3300	3713.01	Nb I	160 c	3718.72	In II	140	3726.49	Hf I	50	3733.672	Th I
940	3713.02	Rh I	10000	3718.86	Tc I	20	3726.54	Cl I	460	3733.79	Hf I
250	3713.08	Ne II	930	3718.88	Sm II	10000	3726.79	Pu II	100	3734.	Bi IV
550	3713.12	Al III	1400	3718.91	Pd I	250	3726.90	Nd II	2400	3734.12	Tm II
60	3713.43	Rh I	130	3718.93	Mn I	8700	3726.93	Ru I	100	3734.34	Cs II
95	3713.45	Eu II	40	3719.16	Eu I	60	3727.093	Fe I	210 c	3734.41	Pr II
550	3713.54	La II	650	3719.28	Hf II	250	3727.11	Ne II	150	3734.43	V I
350	3713.55	U I	260	3719.33	Ru I	285	3727.33	O II	180	3734.69	Yb I
2000	3713.57	Gd I	320	3719.35	Er I	250	3727.34	V II	4	3734.85	Ga II
470	3713.70	Nd II	100	3719.39	W I	200	3727.36	Tc I	5000	3734.864	Fe I
230	3713.73	Os I	590	3719.435	Th I	10 h	3727.42	Ag I	240 c	3735.01	Re I
10	3713.982	Pb II	1800 d	3719.45	Gd II	500	3727.619	Fe I	650	3735.28	Rh I
1	3714.00	Li II	300	3719.45	Tb II	500	3727.69	Mo I	810	3735.31	Re I
290	3714.05	Pr II	210	3719.52	Os I	110	3727.902	Th I	120	3735.324	Fe I
5	3714.16	Li II		3719.53	Gd II	300	3728.00	Dy I	1000 d	3735.54	Nd II
370	3714.20	Nd II	210	3719.80	Ce II	490	3728.02	Ce II		3735.60	Nd II
6 d	3714.27	Li II	50	3719.836	Th I	11000	3728.03	Ru I	50	3735.67	Ti I
8	3714.29	Li II	8000	3719.935	Fe I	710	3728.13	Nd II	400	3735.75	Ba II
350	3714.30	Br II	230	3720.13	Os I	800	3728.42	Ce II	250	3735.76	Pr II
7 d	3714.40	Li II	100	3720.36	Be III	1600	3728.47	Sm II	1600	3735.98	Sm II
10	3714.41	Li II	800	3720.45	Cl III	5	3728.69	Pb III	50	3736.22	W II
1	3714.51	Li II	10000	3720.59	Pu I	55	3728.89	Mn I	100	3736.30	Be I
0	3714.58	Li II	450	3720.72	Ho I	10000	3729.00	Cm I	810	3736.35	Ho I
5	3714.73	Co II		3720.92	Be III	360	3729.03	O IV	190	3736.49	Pr II
640 d	3714.73	Nd II	5	3721.34	K II	160	3729.10	Hf I	140	3736.76	Ta I
45	3714.83	Rh I	410	3721.35	Nd II	400 c	3729.18	Tc I	150	3736.81	Ni I
140	3714.87	La II	150	3721.350	Kr II	70	3729.309	Ar II	410	3736.85	O IV
95	3714.90	Eu II	140	3721.64	Ti II	1300	3729.52	Er II	180	3736.90	Ca II
250	3715.04	Nd II	200	3721.72	Pm II	45	3729.68	Eu II	440	3737.10	Nd II
110	3715.08	O III	770	3721.825	Th II	45	3729.74	Eu II	6000	3737.131	Fe I
6	3715.23	Sn II	930	3721.85	Sm II	2900	3729.82	Ti I	800	3737.14	Sm II
200	3715.39	Nd II	250	3722.07	Gd II	350	3729.82	U II	420	3737.27	Rh I
30	3715.40	Ti I	10000 l	3722.11	Cf II	650	3729.91	Tb II	280	3737.40	Ru I
320	3715.47	V II	220	3722.42	Nd II	7100	3730.43	Ru I	300	3737.42	Tc I
270	3715.53	La II	120	3722.48	Ni I	470	3730.58	Nd II	320	3737.48	Sm II
220	3715.65	Mo I	1500	3722.563	Fe I	130	3730.81	Cr I	160	3737.88	Hf II
600	3715.67	Er III	330	3722.57	Ti I	1500	3730.84	Gd II	50	3737.889	Ar II
470	3715.68	Nd II	20	3722.78	Sb II	130	3731.02	Ta I	600	3738.04	U II
200	3715.75	Pm II	200 r	3722.79	Sb I	10	3731.10	Ga III	1000	3738.06	Nd II
500	3715.94	Tc I		3722.98	Be III	450	3731.26	Er II	45	3738.08	Eu II
60	3716.08	W II	160 c	3723.40	In II	2100	3731.26	Sm II	540	3738.16	Er II
380 w	3716.14	In II	780	3723.50	Nd II	270	3731.26	Zr II	100	3738.306	Fe I
1400	3716.36	Gd II	1500	3723.67	Tc I	200	3731.36	Ir II	270	3738.42	Nb I
1400	3716.37	Ce II	60	3724.21	Yb II	1100	3731.40	Ho I	200	3738.43	Pm I
120	3716.442	Fe I	120	3724.377	Fe I	500	3731.74	Tc I	130	3738.53	Ir I
40	3716.53	Cr I	2000	3724.40	Tc I	140	3731.87	Re I	60	3738.61	Y I
5	3716.60	K II	1600	3724.45	Dy II	130	3731.93	Mn I	450	3738.7	Se III
35	3716.94	Eu II	2	3724.51	Ge III	150	3732.03	Cr I	30	3738.90	Sb III
480	3716.99	Nb I	600	3724.57	Ti I	10000	3732.03	Pu II	60	3738.90	Ti I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
120	3739.04	Hf I	620	3744.83	Gd I	650	3752.569	Th II	1000	3758.54	Tc I
2900	3739.12	Sm II	230	3744.89	O IV	350	3752.66	U II	930	3758.95	Nd II
5	3739.13	K II	100	3744.98	Hf II	370	3752.67	Nd II	660	3758.97	Sm II
410	3739.18	Pr II	400	3745.01	Tc I	3000	3752.67	Pa I	820	3759.00	Gd II
	3739.20	Sm II	650	3745.04	Tb I	5200	3752.86	Ti I	2400	3759.08	La II
60	3739.23	Ni I	10000	3745.40	Bk I	20 h	3753.14	Ag I	350	3759.24	U II
930	3739.34	Dy I	300cw	3745.44	Re I	250	3753.18	Nb I	3300	3759.30	Ti II
10000	3739.35	Cf I	930	3745.46	Sm I	140	3753.22	Hf I	650	3759.35	Tb I
10	3739.38	Ca II	1100	3745.50	Co I	9	3753.34	Ca I	140	3759.60	Pr II
200	3739.43	Er III	6000	3745.561	Fe I	1400	3753.51	Dy II	300	3759.79	Nd II
410	3739.46	Ru I	2800	3745.59	Ru I	760	3753.54	Ru I	1200	3759.84	Ru I
160	3739.57	F II		3745.60	Sm II	10000	3753.63	Pu I	250	3759.87	O III
490	3739.76	Gd I	230	3745.80	V II	600	3753.64	Ti I	370	3760.03	Ru I
2700	3739.80	Nb I	500	3745.86	Pm II	20	3753.65	Rn I	350	3760.04	Sm II
10	3739.89	Rn I	1200	3745.899	Fe I	320 c	3753.73	Ho II	400	3760.05	Fe I
10000	3739.92	Bk I	560	3745.98	Zr II	1400	3753.75	Dy II	120	3760.08	Pr II
160	3739.92	O II	1000	3746.15	Tc I	240	3754.12	Rh I	680	3760.13	W I
25000	3739.935	Pb I	350	3746.33	Rb II	80	3754.245	Kr II	1000	3760.40	Rh I
330	3740.02	Gd II	130	3746.36	Ta I	380	3754.27	Rh I	1900	3760.69	Sm II
910	3740.10	Re I	12 d	3746.36	V V	4000	3754.37	Tc I	620	3760.71	Gd II
140	3740.41	Re I	680	3746.42	U II	2	3754.40	I III	290	3760.92	Gd II
300	3740.68	Pm I	180	3746.47	Os I	110	3754.52	Ta I	260	3761.12	Eu II
670	3740.73	Nb II	400	3746.80	Hf I	2	3754.55	I III	350	3761.14	Tb I
150	3740.99	Pr II	5000	3746.84	Tc I	150	3754.67	O III	2900	3761.32	Ti II
9	3741.05	Sr IV	300	3747.09	Pm II	90	3754.67	N III	6000	3761.33	Tm II
3300	3741.06	Ti I	350	3747.14	U II	20	3754.69	Co II	600	3761.51	Ru I
340	3741.10	Er II	870	3747.17	Tb II	250	3754.83	Nd II	200	3761.68	Pm I
1300	3741.183	Th II	530	3747.20	Ir I	310	3755.09	Ru I	2000	3761.81	Tc I
800	3741.29	Sm II	870	3747.34	Tb II	1100	3755.24	Tb II	680	3761.87	Pr II
350	3741.31	Eu II	900	3747.43	Er I	800	3755.28	Sm II	50	3761.89	Ti II
270	3741.42	Nd II	310	3747.539	Th I	200	3755.43	Ce II	4800	3761.91	Tm II
200	3741.638	Kr II	90	3747.54	N IV	350	3755.48	U II	870	3762.20	Gd I
330	3741.64	Ti II	1200	3747.55	Y II	490	3755.58	Rh I	8	3762.44	Si IV
120	3741.71	W I	480	3747.62	Sm II	370	3755.60	Nd II	1	3762.50	Co III
270	3741.78	Nb I	1200	3747.82	Dy II	20	3755.67	Ca II	660	3762.59	Sm II
100 h	3741.94	Hf III	10000	3747.86	Cm I	210	3755.77	Nb I	300	3762.98	Ce II
200	3742.14	I II	320	3748.06	Ce II	870	3755.93	Ru I	10000	3763.05	Cm I
130	3742.26	Re II	160	3748.10	Ti I	10000	3755.94	Pu I	330	3763.26	U I
240	3742.28	Mo I	3200cw	3748.17	Ho II	540	3756.05	Er I	210	3763.33	Gd II
3500	3742.28	Ru I	1200	3748.22	Rh I	800	3756.41	Sm I	930	3763.47	Nd II
1700	3742.39	Nb I	3000	3748.262	Fe I	300 s	3756.67	Ac II	530	3763.49	Nb I
300	3742.52	Pm II	400	3748.27	Cu III	110	3756.70	Lu I	1500	3763.788	Fe I
900	3742.64	Er II	6	3748.35	Ca I	110	3756.79	Lu I	680	3764.12	Ce II
870	3742.78	Ru I	55	3748.61	Cr I	310	3756.86	Tm II	370	3764.20	Gd II
95	3742.97	Cr I	950	3748.68	U II	1200	3757.05	Dy I	1100	3764.37	Sm II
300 r	3742.97	Pm I	800	3748.81	Cl III	100	3757.12	Os I	480	3764.39	Zr I
285	3743.0	Se III	80	3748.964	Fe I	50	3757.17	Cr I	490	3764.57	U II
10000	3743.05	Bk I	340	3749.00	Cr I	80	3757.21	O III	230	3764.77	Pr II
430	3743.09	Tb	3000	3749.485	Fe I	10000	3757.35	Bk I	200	3765.04	Ce II
400	3743.362	Fe I	360	3749.49	O II	4700	3757.37	Dy II	100	3765.05	Hf I
4500	3743.47	Gd II	200	3749.85	Nd II	430	3757.44	Tb II	350	3765.08	Nb I
80	3743.47	Fe I	50	3749.89	Y I	1200	3757.53	Sm II	2300	3765.08	Rh I
100	3743.56	Eu II	1200	3749.96	Cl II	230	3757.66	Cr I	1700	3765.14	Tb I
480	3743.58	Cr I	10000	3750.08	Bk I	140	3757.69	Ti II	110	3765.240	Th I
1200	3743.87	Sm II	500	3750.09	Pm II	140	3757.694	Th I	150	3765.270	Ar II
570	3743.88	Cr I	8	3750.29	Ca I	230	3757.74	Gd II	400	3765.54	Fe I
120	3743.98	Pr II	320	3750.31	Nd II	510	3757.82	Nd II	100	3765.56	Hf I
110	3744.00	O III	210	3750.87	V II	10000	3757.82	Pu I	300	3765.75	Pm I
5000	3744.06	Tm I	190	3750.98	Pr II	10000	3757.85	Bk I	95	3765.93	Eu II
420	3744.17	Rh I	600	3751.17	U I	430 d	3757.90	Tb II	50	3766.119	Ar II
280	3744.22	Ru I	15	3751.40	Cs II	510	3757.92	W I	250	3766.13	Nb I
300	3744.25	U II	250	3751.45	Ce II	1000	3757.94	Gd I	800	3766.26	Ne II
80	3744.37	Mo II	880	3751.60	Zr II	60	3758.04	Cr I	130	3766.30	Os I
410	3744.40	Ru I	1700	3751.81	Tm I	1500	3758.232	Fe I	60	3766.45	Ti I
5	3744.42	K II	10000	3751.91	Bk I	1400	3758.31	Gd II	140	3766.48	Re I
85	3744.49	Cr I	600	3752.06	Cu III	10000	3758.34	Pu I	300	3766.59	Nd II
800	3744.70	Cu III	1000	3752.13	Tc I	490	3758.35	U I	10	3766.61	Au I
10000	3744.78	Pu I	580	3752.49	Nd II	30	3758.39	Ca II	480	3766.72	Zr I
150	3744.80	Kr II	3700	3752.52	Os I	450	3758.45	Sm II	340	3766.82	Zr II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
430	3766.89	U I	85	3776.271	Th I	430	3783.84	U II	130	3792.14	Cr I
170	3766.92	Hf II	40	3776.3	Xe III	500	3784.06	Tc I	1300	3792.18	Rh I
870	3767.04	Gd II	250	3776.34	Nd II	2400	3784.25	Nd II	390	3792.20	Tb I
600	3767.191	Fe I	60	3776.452	Fe I	3000	3784.29	Ce III	10000	3792.22	Pu I
600	3767.35	Ru I	300	3776.48	U I	270	3784.73	Nd II	300	3792.32	Ce II
6	3767.36	K II	2100	3776.49	Tb II	10000	3785.38	Bk I	490	3792.39	Gd II
480	3767.36	Sm II	1400	3776.56	Y II	330	3785.41	Dy II	70 h	3792.5	Bi II
24	3767.43	Cr I	250	3776.61	Ce II	350	3785.42	Cs II	210	3792.51	Pr II
640	3767.63	Dy I	10000	3776.71	Pu I	1400	3785.46	Hf I	170	3792.76	W I
480	3767.76	Sm II	210	3776.83	Gd I	150	3785.46	Pr II	500	3792.79	Er I
120	3768.14	Os I	1000	3776.97	Cu III	340	3785.600	Th II	570	3793.10	U II
260	3768.24	Cr I	290	3776.99	Os I	10000	3785.61	Cf I	3800	3793.22	Rh I
200	3768.25	Hf I	110	3777.10	Ta I	250	3785.95	Fe I	380	3793.26	U I
120	3768.26	Re I	1000	3777.13	Ne II	840	3786.04	Ti I	120	3793.29	Cr I
8700	3768.39	Gd II	500	3777.27	Tc I	3900	3786.06	Ru I	650	3793.37	Hf II
1000	3768.45	W I	5000 l	3777.50	Am II	200	3786.06	Tc I	600	3793.55	Tb
95	3768.73	Cr I	1500	3777.59	Ru I	3300	3786.18	Dy II	380	3793.57	U II
300	3768.76	Ce II	140	3777.62	Pr II	30 h	3786.18	Lu I	120	3793.79	Ir I
5000	3768.77	Tc I	1400	3777.64	Hf I	150	3786.270	Cu II	130	3793.88	Cr I
230	3768.94	Pr II	140	3777.66	Re I	860	3786.63	Ce II	370	3793.91	Os I
340	3769.09	Ho I	500	3778.089	Kr II	100	3786.68	Fe I	8	3793.95	Tl II
120	3769.21	W I	380	3778.13	Rh I	1800	3786.84	Er II	1600	3793.97	Sm II
620	3769.45	Gd II	1100	3778.14	Sm II	150	3786.86	Pr II	150	3794.34	Fe I
330	3769.53	U II	270	3778.68	V I	1700	3787.06	Nb I	85	3794.61	Cr I
510	3769.65	Nd II	330	3779.22	Tb	320	3787.20	Sm II	6	3794.72	Li I
120	3769.86	W I	500	3779.35	Cl III	410 d	3787.22	Tb II	3900	3794.78	La II
490	3769.97	Rh I	2000	3779.37	Tc I	700	3787.52	Re I	240	3794.92	Ru I
180	3770.056	Th I	710	3779.47	Nd II	1100	3787.56	Gd II	190	3794.93	Pr II
550	3770.10	Yb I	220	3779.77	Mo I	560	3787.86	Er II	1100	3794.96	V I
20	3770.369	Ar I	580	3780.40	Nd II	250	3787.880	Fe I	400	3795.002	Fe I
360	3770.45	Mo I	720	3780.54	Zr I	320	3788.08	Ho II	380	3795.16	Tm II
20	3770.520	Ar II	170	3780.66	Pr II	1500	3788.12	Sm II	170 w	3795.21	In II
1400	3770.69	Gd II	120	3780.67	La II	10000	3788.21	Bk I	20	3795.37	Ar III
210	3770.76	Ce II	3000 c	3780.68	Tc I	1600	3788.44	Dy II	85	3795.386	Th I
10	3770.76	Au I	380	3780.71	U II	1000	3788.47	Rh I	340	3795.45	Nd II
210	3770.97	V II	10000	3780.72	Bk I	7400	3788.70	Y II	400	3795.66	Pm II
3000	3771.03	Tc I	660	3780.76	Sm II	520	3788.75	Ce II	7100	3795.75	Tm II
120	3771.05	N III	300	3780.77	Pm I	40	3788.76	Eu II	70	3795.90	Ti I
10000 s	3771.06	Bk II	1000	3780.77	W I	95	3788.86	Cr I	100	3796.01	Au I
330	3771.11	Dy I	25	3780.840	Ar II	10000 l	3789.04	Cf II	25	3796.11	Si III
250	3771.26	Gd I	420	3780.93	Sm II	100	3789.167	Th I	10000	3796.21	Bk I
300	3771.60	Ce II	50	3780.966	Th I	120	3789.30	Ti I	5100	3796.37	Gd II
600	3771.66	Ti I	410	3781.01	Er II	410	3789.92	Tb I	160	3796.59	Re I
530	3771.85	Nb I	870	3781.01	Nb I	250	3790.092	Fe I	8900 c	3796.75	Ho II
50	3772.649	Th I	300	3781.02	Xe III	620	3790.14	Os I	3500	3796.81	Rb II
170 c	3772.82	Pr II	10000	3781.17	Bk I	1300	3790.15	Nb I	560	3797.06	Er II
640	3773.05	Dy I	1000	3781.17	Cl II	260	3790.22	Mn I	10000	3797.12	Bk
6	3773.15	Si IV	460	3781.18	Ru I	520	3790.32	V I	140	3797.13	Cr I
370 d	3773.33	Sm I	510	3781.32	Nd II	95	3790.45	Cr I	40	3797.22	Te II
	3773.42	Sm II	60	3781.40	Eu II	6000	3790.51	Ru I	420	3797.28	Sm II
540	3773.43	U I	200	3781.43	Pm I	200	3790.63	Gd I	250	3797.30	Mo I
210	3773.45	Gd I	420	3781.47	Dy I	180	3790.73	Os I	200	3797.44	Tc I
340	3773.71	W I	360	3781.59	Mo I	800	3790.80	Cu III	120	3797.518	Fe I
170	3774.06	Pr II	620	3781.62	Ce II	3700	3790.83	La II	160	3797.59	Re I
40	3774.10	Eu I	2100	3782.20	Os I	770	3791.17	Gd II	200	3797.72	Cr I
80	3774.32	Yb I	15	3782.27	Co III	3500	3791.21	Nb I	1600	3797.73	Sm II
10000	3774.33	Y II	50	3782.30	Y II	110	3791.26	O III	1000	3797.77	Tc I
10000	3774.38	Pu I	1000	3782.34	Gd II	500	3791.28	Tc I	170	3797.849	Cu II
120	3774.40	Os I	440	3782.52	Ce II	130	3791.38	Cr I	760	3798.05	Ru I
110	3774.62	Os I	600	3782.74	Ru I	560	3791.40	Zr I	2700	3798.12	Nb I
370	3774.71	Dy I	1900	3782.84	U II	20 c	3791.41	Si III	29000	3798.25	Mo I
300	3775.42	Pm I	2900	3783.05	Gd I	10000	3791.42	Bk I	60	3798.31	Ti I
1400	3775.50	Nd II	500	3783.095	Kr II	45	3791.50	Eu II	250	3798.511	Fe I
600	3775.57	Ni I	6	3783.19	K II	340	3791.50	Nd II	770	3798.54	Tm I
70	3775.72	Rh I	700	3783.53	Ni I	300	3791.73	Tc I	10000	3798.63	Bk I
12000cw	3775.72	Tl I	600	3783.53	Tb I	60 h	3791.74	Yb I	100	3798.66	Hf I
10000	3775.75	Cm I	260	3783.55	Tm II	560	3791.83	Er II	240	3798.75	Tm II
30	3776.06	Ti II	200	3783.58	Ce II	700	3791.87	Dy II	1500	3798.76	Cl II
120	3776.25	Os I	300	3783.78	Nd II	110	3792.02	Ta I	7600	3798.90	Ru I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
5	3799.00	Zn I	140	3805.83	F II	470	3812.27	Dy I	100	3819.38	Hf I
130	3799.01	Eu II	760	3805.92	Rh I	10000	3812.30	Pu II	180	3819.56	Cr I
1500	3799.19	Pd I	10000	3805.93	Pu I	95	3812.45	Rh I	10	3819.607	He I
230 c	3799.21	In II	250	3806.06	Pm II	200	3812.53	Nd II	39000cw	3819.67	Eu II
55	3799.26	Mn I	140	3806.07	Hf II	600	3812.72	Ru I	240	3819.70	Nd II
4900	3799.31	Rh I	580	3806.27	Dy II	600	3812.964	Fe I	1	3819.76	He I
7600	3799.35	Ru I	50	3806.34	Zn II	60	3813.059	Fe I	230	3819.96	V I
10000	3799.37	Pu I	100	3806.38	Hg II	340	3813.068	Th II	1700	3820.20	Cl II
100	3799.41	Tm III	30	3806.54	Si III	900 c	3813.25	Ho II	450	3820.26	Br III
500	3799.54	Sm II	10	3806.60	Ga III	700	3813.45	Be I	2500	3820.425	Fe I
400	3799.547	Fe I	80	3806.696	Fe I	1000	3813.49	V I	300	3820.53	Pm II
240	3799.55	Nd II	3200	3806.72	Mn I	480	3813.63	Sm II	1300	3820.73	Hf I
200	3799.82	Ac II	1300	3806.76	Rh I	470	3813.67	Dy II	930 d	3820.82	Sm
570	3799.91	V I	190	3806.80	V I	380	3813.79	U II	150	3821.179	Fe I
3100	3800.12	Ir I	110	3806.83	Cr I	3700	3813.97	Gd II	230	3821.49	V I
6	3800.14	K II	760 d	3806.85	Tb II	380	3814.06	U II	300	3821.73	Ho II
50	3800.197	Th I	700	3807.14	Ni I	200	3814.42	Ra II	310	3821.80	Pr II
310	3800.26	Ru I	470	3807.23	Nd II	420	3814.63	Sm II	10	3821.85	Au I
680	3800.30	Pr II	50	3807.273	Th I	200	3814.67	Tc I	570	3822.01	V I
850 d	3800.38	Hf I	300	3807.50	V I	710	3814.73	Nd II	60	3822.03	Ti I
110	3800.55	Mn I	95	3807.54	Eu II	430	3814.74	Gd II	650	3822.09	Ru I
150	3800.67	Lu I	600	3807.72	Tm I	470	3815.01	Rh I	3800	3822.26	Rh I
800	3800.89	Sm II	190	3807.74	Re I	10000	3815.29	Bk I	560	3822.41	Zr I
450	3800.9	Se III	110	3807.93	Cr I	180	3815.43	Cr I	410	3822.47	Nd II
20	3800.92	Te II	1000	3808.11	Ce II	120	3815.50	Eu II	450	3822.89	V I
280 r	3801.02	Sn I	420	3808.46	Sm II	530	3815.51	Nb I	10000 s	3823.10	Bk II
20	3801.05	Pt	520	3808.52	V I	1200	3815.65	Br I	150 c	3823.18	Pr II
10000	3801.08	Bk II	310	3808.68	Ru I	120	3815.66	Re I	300	3823.21	V I
370	3801.12	Nd II	540	3808.77	Nd II	20	3815.8	Bi II	120	3823.41	O I
720	3801.29	Gd II	380	3808.92	U I	1500	3815.840	Fe I	2100	3823.51	Mn I
270	3801.30	Nb I	440	3809.06	Nd II	490	3815.85	Ce II	70	3823.52	Cr I
70	3801.36	Eu	600	3809.18	Cu III	1300 h	3816.02	Pr II	390	3823.89	Mn I
200	3801.38	Nd II	140	3809.18	Pr II	10000	3816.30	Cm I	470	3823.90	Ce II
2500	3801.52	Ce II	300 r	3809.20	Pm I	760	3816.47	Rh I	10000 s	3824.08	Bk II
30	3801.66	Hg I	490	3809.21	Ce II	6	3816.56	K II	530	3824.18	Sm II
30	3801.660	Hg I	380	3809.22	U II	770	3816.64	Gd II	80	3824.306	Fe I
330	3801.80	Tb II	290	3809.22	W I	200	3816.69	Ba II	2500	3824.444	Fe I
290	3801.84	Mo I	3	3809.30	Kr IV	90	3816.75	Mn I	300	3824.47	Tc I
2500	3801.90	Rb II	50	3809.456	Ar II	1400	3816.76	Dy II	670	3824.88	Nb I
55	3801.91	Mn I	1300	3809.46	Cl II	4000	3816.78	Er III	550	3824.93	Ru I
30	3801.92	Au I	45	3809.50	Rh I	300	3816.89	Tc I	75	3825.133	Th I
340	3802.30	Nd II	700	3809.59	Mn I	100	3817.20	Hf II	10000	3825.14	Cm I
10000 s	3802.35	Bk I	230	3809.60	V I	230	3817.24	Ir I	10000	3825.19	Bk I
10000	3802.47	Bk I	320	3809.75	Sm II	60	3817.25	Pr III	700	3825.68	Dy II
2700	3802.92	Nb I	320	3809.88	Sm II	760	3817.27	Ru I	10	3825.70	Au I
590	3803.075	Th I	1600	3810.33	Er I	550	3817.39	Tm II	10000 s	3825.84	Bk II
800	3803.09	Ce II	190	3810.38	W I	470	3817.46	Ce II	1500	3825.880	Fe I
160	3803.14	O II	420	3810.43	Sm II	1400	3817.48	W I	350	3826.05	Gd II
25	3803.172	Ar II	580	3810.49	Nd II	7	3817.50	K II	1600	3826.20	Sm II
1200	3803.47	Nd II	670	3810.49	Nb I	210	3817.58	Zr II	290	3826.39	Tm I
570	3803.47	V I	55	3810.69	Mn I	120	3817.66	Pr II	130	3826.42	Cr I
15	3803.51	Hg III	380	3810.72	Tm II	140 d	3817.84	V I	1200	3826.42	Nd II
670	3803.88	Nb I	8900 c	3810.73	Ho II	1300	3818.19	Rh I	750	3826.51	U II
30	3804.01	Au II	260	3810.79	W I	70	3818.22	Ti I	1000	3826.66	Rb II
200	3804.10	Nd II	400	3810.93	Pm I	1300	3818.24	V I	120	3826.67	Pr II
600	3804.13	Cu III	200	3810.94	Ag I	680	3818.28	Pr II	120	3826.68	Eu II
510	3804.14	Dy II	530	3811.03	Nb I	1300	3818.35	Y II	520	3826.70	Mo I
210	3804.39	Gd I	240	3811.06	Nd II	100	3818.43	Ne II	140	3826.921	Cu II
530	3804.74	Nb I	12	3811.1	Bi II	70	3818.48	Cr I	230	3827.33	Gd II
530	3804.80	Cr I	120	3811.33	Eu I	50	3818.685	Th I	10000	3827.41	Bk I
290	3804.84	Pr II	10000	3811.40	Pu I	80	3818.69	Pt I	10000	3827.57	Pu I
210	3805.09	Gd II	270	3811.77	Nd II	430	3818.75	Gd II	2800	3827.59	Cl II
500	3805.10	Cs II	320	3811.78	Hf I	210	3818.86	Nb II	1200	3827.823	Fe I
1900	3805.18	Cl II	50	3811.78	Ag I	100	3818.879	Cu II	240	3828.00	Nd II
200	3805.345	Fe I	390	3811.84	Pr II	300	3819.02	Ce II	240	3828.19	Ti I
2500	3805.36	Nd II	490	3811.86	Ho I	760	3819.03	Ru I	450	3828.384	Th I
560	3805.52	Gd II	1900	3811.99	U I	120	3819.14	Pr II	2300	3828.48	Rh I
340	3805.55	Nd II	500	3812.07	Sm II	210	3819.15	Nb I	500	3828.54	Tc I
320	3805.63	Sm II	250	3812.20	Ce II	200	3819.26	Pm II	1700	3828.56	V I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
540	3828.85	Nd II	10000 s	3835.97	Bk II	270	3842.34	Pr II	550	3849.25	Zr I
940	3828.87	Mo I	250	3836.06	Os I	7	3842.46	Si III	110	3849.32	V I
75 h	3829.07	Lu I	270	3836.10	Ce II	920 d	3842.50	Tb II	140	3849.36	Cr I
110	3829.13	W I	120	3836.30	Re I	340	3842.60	As II	330	3849.39	Dy II
440	3829.16	Nd II	250	3836.45	Nb I	200	3842.80	Ba II	140	3849.52	Hf II
390	3829.27	Ho I	2300	3836.50	Dy II	200	3842.88	Pm II	300	3849.88	Ho I
140	3829.30	Mg I	740	3836.54	Nd II	300	3842.98	Pm II	540	3849.91	Er I
230	3829.46	Gd II	70	3836.584	Th I	550	3843.02	Zr II	10000	3849.92	Cm I
140	3829.67	Hf I	1300	3836.76	Zr II	610	3843.03	Sc II	190	3849.94	Os I
200	3829.68	Mn I	95	3836.78	Ti I	2500	3843.20	Cl II	200	3849.96	Fe I
120	3829.75	Ne II	970	3836.91	Gd II	120	3843.256	Fe I	260	3849.99	F II
280	3830.02	Hf I	10000	3836.96	Pu I	1400	3843.28	Gd I	290	3850.04	Cr I
130	3830.03	Cr I	1300cw	3837.51	Ho II	1600	3843.50	Sm II	20	3850.22	Sb II
1500	3830.26	Tb I	1500	3837.56	Tc I	75	3843.61	Lu I	470	3850.22	Nd II
530	3830.29	Sm II	10000	3837.59	Cm I	200	3843.76	Ce II	7	3850.40	Mg II
200	3830.35	Tc I	340	3837.91	Nd II	1100	3843.86	Ho II	760	3850.43	Ru I
510	3830.47	Nd II	310	3838.07	Ru I	350	3843.98	Mn I	70	3850.581	Ar II
3600	3830.48	Er II	1300	3838.20	Tm II	140	3844.23	Eu II	3300	3850.69	Gd II
10000	3830.55	Bk I	500	3838.29	Mg I	330	3844.36	Dy I	1200	3850.79	Pr II
470	3830.55	Ce II	160	3838.3	S III	380	3844.44	V I	120	3850.817	Fe I
960	3830.72	Pr II	285	3838.37	N II	150 c	3844.54	Pr II	5100	3850.97	Gd II
490	3831.08	Ce II	290	3838.51	W I	1400	3844.58	Gd II	10000	3850.99	Cl II
2000	3831.46	U II	1100	3838.54	Ce II	30	3845.11	Ge II	10000	3851.01	Pu I
1100	3831.50	Sm II	10000	3838.92	Pu I	3100	3845.37	Cl II	300	3851.22	Tc I
10000 l	3831.57	Bk II	500	3838.94	Sm II	250	3845.38	Pm II	7900	3851.37	Cl II
110	3831.69	Ni I	1700	3838.98	Nd II	6900	3845.47	Co I	720 c	3851.55	Pr II
300	3831.73	Gd III	160	3839.00	V I	370 d	3845.61	Tb II	27	3851.57	W II
370	3831.80	Gd II	120	3839.257	Fe I	3900	3845.65	Cl II	320	3851.60	Er II
760	3831.80	Ru I	110	3839.38	V I	10	3845.8	Bi II	1200	3851.65	Cl II
320cw	3831.9	Ho II	340	3839.51	Nd II	1500	3845.80	Cl II	2400 d	3851.66	Nd II
1500	3832.29	Pd I	300	3839.52	Pm I	210	3845.90	Nb I	250	3851.67	F II
300	3832.30	Mg I	1200	3839.63	U I	800	3845.97	Tc I		3851.74	Nd II
10	3832.30	Tl II	1000	3839.64	Gd II	120	3846.00	La II	10000	3851.85	Pu I
200	3832.45	Tc I	930	3839.70	Ru I	730	3846.22	W I	420	3851.88	Sm II
600	3832.82	Tc I	840	3839.746	Th II	420	3846.34	Dy II	85	3852.135	Th I
4000	3832.88	Y II	350	3839.78	Mn I	60	3846.45	Ti I	140	3852.22	Cr I
210	3832.97	Gd I	170	3839.91	Yb I	220	3846.52	Ce II	320	3852.40	Ho II
270	3833.07	Sc II	100	3840.29	Zn II	580	3846.59	Pr II	4300	3852.45	Gd II
10000	3833.32	Cm I	150	3840.30	Os I	10000 l	3846.62	Bk I	960	3852.80	Pr II
4500	3833.35	Cl II	500	3840.437	Fe I	480	3846.68	Ru I	100	3852.82	In III
540	3833.42	Tb I	570	3840.44	V I	490 c	3846.73	Ho II	1	3852.98	Rh III
10000 s	3833.48	Bk	400	3840.45	Sm II	80	3846.800	Fe I	1200	3853.03	Dy II
95	3833.68	Ti I	600	3840.72	La II	100	3846.887	Th I	130	3853.05	Ti I
210	3833.74	Ta II	100 h	3840.74	Ag I	550	3847.01	Zr I	860	3853.15	Ce II
1700	3833.75	Mo I	2600	3840.75	V I	420	3847.02	Dy I	95	3853.29	Lu I
530	3833.83	Sm II	290	3840.87	Tm I	270	3847.09	F II	530	3853.30	Sm I
480	3833.86	Mn I	370	3840.89	Dy I	380	3847.25	Mo I	100 h	3853.66	Si II
2000	3833.89	Rh I	480	3840.99	Pr II	320	3847.33	V I	130	3853.73	Ti I
280	3834.22	V I	800	3841.047	Fe I	250	3847.49	W I	2	3853.96	Mg I
1000	3834.222	Fe I	670	3841.08	Mn I	530	3847.51	Sm II	1800 c	3854.07	Ho II
1300	3834.36	Mn I	2700	3841.18	Lu I	500	3847.60	Tc I	12	3854.08	Pb III
560	3834.48	Sm I	380	3841.28	Cr I	10000	3847.63	Bk I	10000	3854.11	Cm I
490	3834.55	Ce II	150	3841.29	Os I	15	3847.85	Ag I	1200	3854.18	Ce II
560	3834.60	Sm II	1400	3841.31	Dy II	70	3847.87	Y II	2700	3854.21	Sm II
250 c	3834.65	In II	800	3841.31	Tc I	8900	3848.02	Tm II	190	3854.22	Cr I
7	3834.679	Ar I	4	3841.44	Sn II	100	3848.05	Ta I	620	3854.22	U I
350	3834.69	Br II	100	3841.5	Xe III	250	3848.10	Ce II	1200	3854.31	Ce II
45	3834.75	Rh I	410 d	3841.82	Nd II	8	3848.24	Mg II	390	3854.511	Th II
140	3834.93	Pr II		3841.88	Nd II	1700 d	3848.24	Nd II	480	3854.56	Sm I
330	3834.99	Gd II	110	3841.89	V I		3848.31	Nd II	2400	3854.64	U II
220	3835.05	Ru I	280	3841.960	Th II	1500	3848.52	Nd II	100	3854.76	Ba II
1100	3835.06	W I	330	3842.00	Dy II	860	3848.59	Ce II	130	3854.91	La II
190	3835.08	La II	10000	3842.00	Cm I	490 p	3848.60	U II	1	3854.96	Mg I
350	3835.18	Nb I	1400	3842.05	Co I	3700	3848.73	Tb II	10000	3855.03	Bk I
410 c	3835.35	Ho II	410 c	3842.05	Ho II	640	3848.78	Sm II	620	3855.29	Ce II
5	3835.384	H I	10000	3842.10	Pu I	1	3848.91	Mg I	110	3855.29	Cr I
10000	3835.52	Pu I	200 c	3842.18	In II	190	3848.98	Cr I	1200	3855.37	V I
370	3835.72	Sm II	10000	3842.19	Bk I	1600	3849.02	La II	150	3855.55	W I
2200	3835.96	Zr I	1200	3842.20	Gd II	800	3849.18	Hf I	470	3855.56	Gd II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
140	3855.57	Cr I	160	3864.137	Cu II	260	3873.52	Ru I	10000	3880.11	Bk I
3000	3855.84	V I	180	3864.34	W I	250	3873.57	Gd I	30	3880.25	Au I
680	3855.90	Er I	770	3864.34	Zr I	5	3873.74	K II	780	3880.38	Nd II
800	3855.90	Sm II	1300	3864.86	V I	150	3873.761	Fe I	680	3880.47	Pr II
500 h	3856.02	Si II	40	3865.13	Be I	2800	3873.96	Co I	60	3880.5	Xe III
2500	3856.372	Fe I	320	3865.24	Sm II	1200	3873.99	Dy II	1500	3880.61	Er II
480	3856.46	Ru I	80	3865.42	Be I	300	3874.03	Pm I	600 c	3880.72	Tc I
5900	3856.52	Rh I	480 c	3865.45	Pr II	620	3874.04	U II	800	3880.77	Sm II
500 c	3856.73	Tc I	230	3865.47	Os I	320 c	3874.09	Ho II	1200	3880.78	Nd II
390cw	3856.94	Ho II	1	3865.51	Be I	3500 w	3874.17	Tb II	380	3880.82	Hf II
390	3857.02	Ce II	150	3865.523	Fe I	30	3874.26	Sr III	12	3881.21	Ti III
230	3857.09	Os I	190	3865.57	Eu I	110	3874.41	W I	450	3881.38	Sm II
1300	3857.55	Ru I	170	3865.64	Ir I	70	3874.53	Cr I	730	3881.41	W I
260	3857.63	Cr I	6	3865.72	Be I	40	3874.61	Lu I	1000	3881.45	U II
370	3857.64	Ce II	1900	3865.92	U II	270	3874.68	Ce II	200	3881.59	Nd
720	3857.72	Ho II	100	3866.03	Be I	630	3874.68	Ho II	540	3881.61	Ho II
140	3857.84	Tm II	240	3866.44	Ti I	100	3874.73	Au I	300	3881.68	Cu III
480	3857.91	Sm II	240	3866.52	Nd II	1500	3875.08	V I	450	3881.79	Sm II
170	3858.14	Ti I	370	3866.58	Dy II	400	3875.19	Sm II	250	3881.86	Os I
120	3858.25	Pr II	380	3866.80	U II	240	3875.26	Re I	300	3881.99	Dy II
1200	3858.30	Ni I	220	3866.81	Nd II	260	3875.26	Ti I	170	3882.15	Ti I
600	3858.31	Hf I	500	3866.96	Y III	210	3875.374	Th I	170	3882.33	Ti I
10	3858.32	Ar III	1600	3866.99	Gd I	150 h	3875.44	Kr II	490	3882.36	U II
540	3858.39	Er II	60	3867.215	Fe I	220	3875.46	Gd II	1500	3882.45	Ce II
420	3858.40	Dy I	210	3867.52	Pr II	560	3875.54	Sm II	320	3882.50	Sm II
340	3858.55	Nd II	285	3867.6	S I	200	3875.66	Tc I	200	3882.52	Hf I
400	3858.74	Sm I	230	3867.60	V I	240	3875.74	Nd II	10	3882.58	Yb III
2	3858.86	Mg I	1300	3867.84	Ru I	12	3875.78	Ca I	10000 l	3882.60	Bk I
290	3858.95	Nb I	270	3867.92	Nb I	12	3875.80	Ca I	1200	3882.89	Er II
110	3859.14	Pr II	1800	3867.99	W I	470	3875.87	Nd II	500	3882.89	Ti I
150	3859.212	Fe I	100	3868.	Bi IV	420	3875.90	V I	6800	3883.13	Tm I
150	3859.30	W I	200	3868.13	Ce II	570	3876.09	V I	670	3883.14	Nb I
4900	3859.57	U II	1000	3868.24	Tc I	150 c	3876.143	Cs I	380	3883.28	U II
140	3859.840	Th II	170	3868.40	Ti I	350	3876.19	C II	660	3883.29	Cr I
10000 l	3859.89	Bk II	560	3868.45	Dy II	480	3876.19	Pr II	330	3883.34	Tb I
10000	3859.911	Fe I	35	3868.528	Ar II	350	3876.41	C II	50	3883.34	Zn I
5	3860.58	Kr IV	40 h	3868.70	Kr III	530	3876.65	Lu II	1800	3883.44	Tm II
220	3860.72	Ru I	1600	3868.81	Dy I	350	3876.66	C II	50	3883.66	Cr I
450	3860.74	Rb II	850	3869.07	Nd II	730	3876.77	Os I	150	3883.77	Hf II
25000	3860.83	Cl II	580	3869.08	Mo I	80	3876.82	Y I	280	3884.131	Cu II
230	3860.91	Hf I	6	3869.15	Tl II	240	3876.86	Re I	150	3884.75	Eu I
270	3860.94	Nd II	300	3869.42	Dy II	620	3876.97	Ce II	15	3884.78	Ge III
4400	3860.99	Cl II	100	3869.663	Th I	160	3877.10	Hf II	440 c	3885.19	Pr II
490	3861.17	U II	450 d	3869.75	Tb II	1700 c	3877.18	Pr II	100	3885.20	Ta I
1000	3861.37	Cl II	820	3869.86	Dy II	70	3877.27	Eu II	570	3885.22	Cr I
2700 c	3861.68	Ho II	240	3869.94	Re I	380	3877.34	Rh I	3700	3885.29	Sm II
60 l	3861.80	Pr III	490	3870.01	Rh I	530	3877.56	Nb I	1500	3885.42	Zr I
500	3861.93	Po I	15	3870.16	Cs II	990	3877.60	Zr I	1100	3885.44	Nb I
660	3862.05	Sm II	9	3870.48	Ca I	800	3877.62	Pm II	1	3885.50	K III
150	3862.22	V I	210	3870.72	Pr II	200	3877.8	Xe III	670	3885.68	Nb I
350	3862.23	Sm II	1500	3871.03	U I	10000 l	3877.94	Bk II	300 r	3885.79	Pm I
200	3862.46	Ce II	170	3871.08	V I	250	3878.018	Fe I	210	3886.07	Nb I
300	3862.52	Nd II	300	3871.21	Br II	620	3878.08	U II	4000	3886.282	Fe I
200 h	3862.60	Si II	3400	3871.64	La II	480	3878.28	Y II	1700	3886.37	La II
540	3862.62	Ho I	800	3871.78	Sm II	3	3878.31	Mg I	380	3886.79	Cr I
650	3862.69	Ru I	360	3872.05	Ho II	1100	3878.36	Ce II	580	3886.82	Mo I
7500	3862.85	Er I	7000	3872.11	Dy II	10000	3878.54	Pu I	100	3886.915	Th I
250	3863.05	Gd II	70	3872.39	Rh I	2000	3878.573	Fe I	200	3887.048	Fe I
200	3863.07	Tc I	12	3872.50	Ti III	1100	3878.58	Nd II	10	3887.15	Tl II
2000 s	3863.12	Ac II	250	3872.501	Fe I	4	3878.62	K II	20	3887.17	Yb III
3700 d	3863.33	Nd II	11	3872.54	Ca I	130	3878.71	V II	5400	3887.35	Tm I
350	3863.38	Nb I	200	3872.55	Hf II	870	3878.82	Nb I	30	3887.77	Y I
	3863.40	Nd II	11	3872.56	Ca I	200	3879.05	Zr I	540	3887.87	Nd II
450	3863.405	Th II	45	3872.72	Eu I	470	3879.11	Dy II	60 h	3888.02	Ti I
130	3863.87	V I	250	3872.84	W I	500 c	3879.16	Tc I	480	3888.22	Tb I
2900	3863.87	Zr I	340	3872.85	Yb I	270	3879.20	Pr II	70	3888.34	Rh I
30	3863.9	Bi II	5500	3873.12	Co I	1000	3879.55	Nd II	300	3888.513	Fe I
29000	3864.11	Mo I	120	3873.21	Ti I	140	3879.644	Th I	80 c	3888.608	Cs I
400	3864.11	Tc I	3000	3873.35	Pa I	20	3879.98	Yb III	500	3888.65	He I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
3000 c	3888.96	Ho II	10000	3895.89	Pu I	480	3902.51	Ir I	700	3909.89	V I
6	3889.049	H I	330	3895.99	Tb I	410	3902.55	U II	40	3909.91	Ba I
6	3889.10	Ca I	270	3896.13	Nd II	300	3902.71	Gd I	300	3910.24	Gd III
660	3889.16	Sm II	5200	3896.23	Er II	810	3902.76	Er II	1000	3910.26	Pm II
	3889.22	Sm II	10	3896.33	Ti III	360	3902.92	Cr I	100	3910.79	V I
200	3889.23	Hf I	150	3896.55	Yb III	400	3902.945	Fe I	2000	3911.16	Nd II
20	3889.33	Ba I	330	3896.58	Tb II	19000	3902.96	Mo I	110 h	3911.19	Ti I
200	3889.33	Hf I	440	3896.62	Tm I	110	3903.102	Th I	140	3911.27	Yb I
440 c	3889.34	Pr II	540	3896.76	Ho II	60	3903.16	Cr I	20 h	3911.40	Co II
30	3889.48	Au I	490	3896.77	U II	170	3903.177	Cu II	330	3911.67	U II
370 h	3889.66	Nd II	23	3896.78	Eu I	200	3903.34	Ce II	29	3911.77	Lu I
30	3889.67	Ni I	590	3896.80	Ce II	1300	3903.42	Sm II	320	3911.80	Ho I
100	3889.78	In II	1000	3896.98	Cs II	170	3903.82	F II	23000	3911.81	Sc I
1300	3889.93	Nd II	1600	3896.98	Sm II	4	3903.86	Mg I	120hd	3911.82	Cr I
70	3889.95	Ti I	190	3897.25	Pr II	200	3903.95	Br III	85	3911.909	Th I
1000	3889.98	Ce II	440	3897.63	Nd II	250	3903.98	Er I	450	3911.96	O II
610	3890.08	Sm II	40	3897.65	Cr I	10000	3904.06	Cm II		3912.00	Cr I
700	3890.18	V I	400	3897.86	Au I	29	3904.22	Rh I	10000 l	3912.16	Bk II
2900	3890.32	Zr I	330	3897.89	Tb I	240	3904.29	Gd I	230	3912.19	Ce II
2200	3890.36	U II	140 h	3897.91	W I	460	3904.30	U II	220	3912.21	V I
490	3890.42	Ho I	8	3897.92	K II	250	3904.34	Ce II	850	3912.23	Nd II
440	3890.53	Tm II	280 h	3898.02	V I	320	3904.44	Ho I	980	3912.44	Ce II
1300	3890.58	Nd II	490	3898.27	Ce II	250	3904.56	Er II	15	3912.75	Yb III
400	3890.61	Er II	5	3898.48	F I	60 h	3904.59	Y I	23	3912.83	Rh I
210	3890.75	Ce II	85	3898.49	Ti I	2600	3904.78	Ti I	630	3912.90	Pr II
1300	3890.94	Nd II	5800	3898.53	Dy II	50	3904.81	Yb II	20	3913.23	Yb III
250	3890.97	Pm I	300	3898.73	Pm I	200	3904.812	P III	500	3913.46	Ti II
210	3890.98	Ce II	190	3898.83	F II	170	3905.186	Th II	120	3913.51	Rh I
13000 c	3891.02	Ho II	210	3898.84	Pr II	1200	3905.40	Er I	310	3913.55	Pr II
320	3891.21	Sm II	270	3898.94	Ce II	300	3905.523	Si I	340	3913.69	Nd II
580	3891.30	Nb I	140	3899.13	V II	450	3905.65	Gd I	1500	3913.87	Cl II
2000	3891.38	Zr I	2400	3899.20	Tb II	20	3905.67	Te II	130	3913.92	Re I
580	3891.51	Nd II	1200	3899.707	Fe I	1300cw	3905.68	Ho II	300	3914.20	Br II
400	3891.63	Br II	400	3899.78	Pm II	1700	3905.89	Nd II	250	3914.314	P III
120 c	3891.71	Pr II	620	3899.78	U II	10000 s	3906.09	Bk II	140	3914.33	V II
1400 l	3891.78	Ba II	600	3899.83	Tc I	150	3906.177	Kr II	500	3914.34	Ti I
2	3891.91	Mg I	620	3899.94	Hf I	11000	3906.31	Er II	500	3914.38	Br II
60	3891.93	Cr I	23	3900.18	Eu I	60	3906.37	Hg I	50 h	3914.40	Ag I
470	3892.06	Nd II	140 h	3900.18	V I	60	3906.372	Hg I	100	3914.47	Ac II
300 w	3892.12	Tc I	2000	3900.21	Nd II	380	3906.45	U I	4000	3914.58	Y III
1000	3892.15	Pm II	10000	3900.25	Cm I	250	3906.479	Fe I	670	3914.70	Nb I
650	3892.21	Ru I	140	3900.39	Os I	100	3906.75	V I	500	3914.73	Ba II
100 h	3892.26	Au I	70	3900.51	Eu I	200	3906.92	Ce II	24	3914.74	Ti I
20	3892.65	Ba I	400	3900.52	Zr I	350	3906.93	Cs II	210	3914.76	Pr II
4200	3892.68	Er I	530	3900.54	Ti II	28000cw	3907.10	Eu II	540	3914.87	Dy II
620	3892.68	U II	450	3900.68	Al II	770	3907.29	Ce II	440	3915.13	Nd II
110	3892.72	W I	40	3900.73	Pt I	250	3907.29	Rb II	45	3915.24	Eu II
460	3892.86	V I	3000	3900.74	Y III	50 h	3907.41	Ag I	20	3915.30	Li I
150	3892.924	Cu II	680	3900.79	Tm II	20000	3907.49	Sc I	20	3915.35	Li I
200	3893.22	Tc I	340	3900.85	Yb I	200	3907.70	Nd II	480	3915.38	Ir I
10000 s	3893.23	Cf II	180	3900.96	Ti I	7	3907.84	Ar III	650	3915.43	Tb I
2	3893.30	Mg I	30	3901.09	Au I	510	3907.84	Nd II	15	3915.47	Ti III
12	3893.63	Ti III	140 h	3901.15	V I	100 l	3907.91	Xe II	390	3915.52	Ce II
260	3894.04	Cr I	300	3901.24	Br II	770 c	3908.05	Pr II	540	3915.59	Dy II
400	3894.05	Sm II	1600	3901.33	Tb I	480	3908.06	Tb I	120	3915.84	Cr I
7900	3894.08	Co I	50	3901.661	Th I	100	3908.21	Re I	380	3915.88	U II
490	3894.12	U I	190	3901.71	Os I	10000	3908.24	Cm II	310	3915.94	Zr II
2200	3894.20	Pd I	380	3901.77	Mo I	560	3908.41	Ce II	610	3915.95	Nd II
10000 l	3894.55	Bk II	1300	3901.84	Nd II	390	3908.54	Ce II	45	3916.00	Eu I
810	3894.63	Nd II	20	3901.867	Hg I	50	3908.750	Th I	1300	3916.05	La II
490	3894.64	Tb I	20	3901.87	Hg I	960	3908.76	Cr I	390	3916.14	Ce II
1500	3894.70	Gd II	180	3901.93	F II	210	3908.97	Nb I	190	3916.24	Cr I
90	3894.97	Sc I	285	3902.0	S I	760	3909.08	Ru I	10000 l	3916.37	Bk II
620	3895.11	Ce II	100 c	3902.07	In II	380	3909.14	Tb I	100	3916.41	V II
200 h	3895.25	Ti I	35	3902.11	Cr I	270	3909.31	Ce II	50	3916.417	Th I
340	3895.419	Th I	290	3902.23	Ho II	50	3909.31	Ag II	3500	3916.48	Tm I
3	3895.57	Mg I	2400	3902.25	V I	300	3909.38	Au I	2200	3916.51	Gd II
800	3895.656	Fe I	750	3902.40	Gd II	250	3909.50	Pm II	1100	3916.63	Cl II
450	3895.79	Gd II	250	3902.45	Pr II	330	3909.55	Tb I	80	3916.731	Fe I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
10	3917.20	Rn I	110	3922.96	Pt I	32000cw	3930.48	Eu II	140	3937.040	Th II
380 c	3917.27	Re I	5	3923.00	K II	240	3930.66	Y II	670	3937.44	Nb I
540 d	3917.29	Dy I	560	3923.11	Ce II	8	3930.69	F I	20	3937.87	Ba I
230	3917.29	Eu I	450	3923.25	Gd II	430	3930.98	U II	560	3938.09	Ce II
620	3917.44	Sm II	320	3923.38	Dy II	770	3931.09	Ce II	250	3938.30	Pr II
35	3917.60	Cr I	1500	3923.47	Ru I	500	3931.23	Yb III	6	3938.40	Mg I
230	3917.64	Ce II	6	3923.48	Ca I	150	3931.34	V I	90	3938.52	N III
340	3917.65	Nd II	45	3923.51	Sc II	310	3931.37	Ce II	250	3938.59	Os I
23	3917.70	Eu II	300 c	3923.66	Tc I	320	3931.38	Hf I	2100	3938.63	Er II
280	3918.05	Er I	200	3923.90	Hf II	30	3931.49	Te II	220	3938.85	Ho I
620	3918.09	Hf II	400	3924.09	Br II	2100	3931.52	Dy II	510	3938.86	Nd II
50 h	3918.25	Y I	9	3924.39	Ga II	600	3931.76	Ru I	120	3939.04	Hf I
770	3918.28	Ce II	20	3924.47	Si III	230	3931.83	Ce II	810 d	3939.52	Tb II
65	3918.32	Mn I	1100	3924.53	Ti I	3000	3931.83	Pa I	200	3939.67	Ba II
210	3918.35	Er II	450	3924.64	Ce II	60	3932.00	Al I	350	3939.69	Br II
210	3918.51	Ta I	240	3924.66	V I	35	3932.02	Ti II	770	3940.34	Ce II
40	3918.52	Eu I	10	3924.86	Ti III	2000	3932.02	U II	10 h	3940.43	Ag I
20	3918.54	Te II	140	3925.093	Th I	320	3932.22	Dy II	330	3940.48	U II
1300 c	3918.85	Pr II	150	3925.24	V I	810	3932.25	Er II	25000	3940.51	Rb II
50	3918.86	Lu I	760	3925.45	Tb II	25	3932.547	Ar II	320cw	3940.53	Ho II
100	3918.92	Hg II	960	3925.47	Pr II	200	3932.911	Th I	300 h	3940.80	Sr I
570	3918.98	C II	500	3925.58	Cs II	370	3933.00	Dy II	310	3940.97	Ce II
360	3919.00	N II	35	3925.719	Ar II	6	3933.05	Tl III	65	3941.48	Mo II
110	3919.023	Th I	500	3925.87	Cl III	120	3933.268	Cu II	410	3941.49	Cr I
100	3919.09	Eu II	3300	3925.92	Ru I	360	3933.3	S II	2000	3941.51	Nd II
1000	3919.10	Pm II	330	3926.21	U I	4400	3933.38	Sc I	55	3941.56	Eu II
1900	3919.16	Cr I	5000 l	3926.25	Am II	310	3933.55	Ru I	10	3941.72	Rn I
160	3919.29	O II	110	3926.32	Ti I	230	3933.66	Ca II	450	3941.80	Gd I
300	3919.38	Tc I	5	3926.36	K II	200	3933.70	Tc I	1300	3941.87	Sm II
320	3919.45	Ho I	120	3926.42	Hf I	310	3933.73	Ce II	10000	3942.03	Cm I
350	3919.51	Br II	2500 l	3926.44	Rb II	260	3934.01	V I	50	3942.072	Th I
480	3919.52	Tb II	120	3926.47	Mn I	200	3934.12	Zr II	2000	3942.15	Ce II
420	3919.63	Pr II	35 h	3926.62	Lu I	320	3934.21	Dy II	30 h	3942.21	Eu II
480	3919.81	Ce II	30	3926.65	Cr I	2000	3934.23	Rh I	540	3942.53	Dy II
35	3919.82	Ti I	330	3926.72	U I	70	3934.24	Ti I	6	3942.53	K II
220	3919.92	Nd II	25	3926.85	Ba III	5	3934.26	F I	590	3942.63	Gd I
200	3920.081	Kr II	510	3927.10	Nd II	5	3934.29	Kr IV	590	3942.72	Rh I
70	3920.10	Ag II	480	3927.46	Pr II	65 c	3934.40	In II	2700	3942.75	Ce II
530	3920.20	Nb I	160	3927.56	La I	1200	3934.79	Gd I	60	3942.94	Eu II
600	3920.258	Fe I	150	3927.57	Hf I	200	3934.79	Zr II	10 h	3942.97	Ag I
100	3920.49	V I	200	3927.57	Tc I		3934.82	Gd II	230	3943.04	Mo I
250	3920.53	Pr II	100	3927.69	Au I	610	3934.82	Nd II	120	3943.08	Eu II
140	3920.654	Cu II	420	3927.86	Dy I	400	3934.84	Ir I	270	3943.24	Gd I
800	3920.69	C II	1200	3927.920	Fe I	45	3934.98	Rh I	620	3943.24	Sm II
260	3920.92	Ru I	200	3927.93	V I	150	3935.03	W I	220	3943.62	Gd I
1100	3920.96	Nd II	10 h	3928.01	Ag I	150	3935.14	V I	150	3943.66	V I
600	3921.02	Cr I	10000 l	3928.05	Bk II	650	3935.24	Tb II	520	3943.67	Nb I
12	3921.38	Ti III	1900	3928.28	Sm II	9	3935.29	Ca I	1200	3943.82	U I
10000	3921.42	Bk I	10000	3928.53	Pu I	220	3935.38	Gd I	770	3943.89	Ce II
290	3921.42	Ti I	160	3928.6	S III	490	3935.38	U II	4500 r	3944.006	Al I
1100	3921.54	La II	50	3928.623	Ar II	120	3935.65	Hf II	10000	3944.15	Cm I
10	3921.61	Ti III	600	3928.64	Cr I	50	3935.72	Ba I	300	3944.21	Pm II
590	3921.73	Ce II	120	3928.66	Tm II	470	3935.76	Sm II	3200	3944.42	Er I
610	3921.79	Zr I	40	3928.87	Eu II	370	3935.82	Pr II	30	3944.59	Eu II
280	3921.88	Er II	2200	3929.22	La II	50	3935.84	Rh I	10000	3944.68	Dy II
100	3921.90	V I	200	3929.26	Nd II	1500	3935.97	Co I	110	3944.72	Re I
300	3922.10	Tb II	370	3929.29	Pr II	410	3936.11	Nd II	20	3944.82	Cl I
60 d	3922.12	In II	1200	3929.53	Zr I	180	3936.22	La II	1400	3945.54	Gd I
240	3922.19	Rh I	110	3929.54	Hf II	100	3936.28	V I	760	3945.57	Ru I
500	3922.20	Rb II	300	3929.55	Br II	30	3936.40	Sr III	30	3945.67	Eu II
2500	3922.40	Sm II	570	3929.58	Tm II	320 c	3936.44	Ho II	180	3945.91	Re I
230	3922.43	V I	590	3929.669	Th II	800	3936.48	Pm II	2	3946.02	Tl III
500	3922.55	Xe III	550	3929.85	Re I	10000	3936.67	Cm I	6	3946.04	Ca I
325	3922.6	As III	890	3929.88	Ti I	420	3936.70	Dy I	70	3946.097	Ar II
480	3922.74	Tb II	100	3930.00	Os I	30	3936.72	Sr III	120	3946.27	Ir I
140	3922.78	Ta I	260	3930.02	V I	800	3936.80	Ce III	500	3946.51	Sm II
1200	3922.911	Fe I	60 h	3930.11	Y I	140	3936.90	Re I	4000 c	3946.57	Tc I
140	3922.92	Ta I	540	3930.14	Dy I	120	3936.97	W I	650	3946.89	Tb II
12	3922.95	Ti III	2000	3930.296	Fe I	3200	3937.01	Er I	420	3946.93	Dy II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
2000	3947.09	Tc I	900 c	3953.51	Pr II	600	3962.87	Er III	1500	3971.40	Sm II
185	3947.29	O I	320	3953.52	Nd II	1500	3963.00	Sm II	320	3971.67	Pr II
160	3947.48	O I	300	3953.58	U II	80 h	3963.10	Co II	450	3971.68	Ce II
6 h	3947.49	Si III	340	3953.66	Ce II	1400	3963.12	Nd II	450	3971.75	Gd II
7	3947.505	Ar I	150	3953.81	Cu III	3	3963.16	I III	210	3971.85	Nb I
140	3947.59	O I	16	3954.33	Fe III	30	3963.61	Eu I	30000cw	3971.96	Eu II
730 c	3947.63	Pr II	220	3954.37	O II	1000	3963.63	Os I	150	3972.04	F II
1100	3947.78	Ti I	420	3954.55	Dy II	220	3963.66	Gd II	270	3972.07	Ce II
310	3947.97	Ce II	100	3954.61	O I	1900	3963.69	Cr I	620 c	3972.14	Pr II
20	3947.98	Te II	360	3954.67	U II	6	3963.84	Si III	200	3972.155	Th I
120	3947.98	W I	300 r	3954.76	Pm I	270	3963.90	Nd II	35	3972.17	Ni I
50	3948.030	Th I	60 h	3955.09	Y I	350	3964.21	U I	8	3972.57	Ca I
550	3948.06	Er I	6	3955.21	K II	560	3964.26	Pr II	6	3972.58	K II
740	3948.11	Sm II	200	3955.30	W I	950	3964.27	Ti I	160	3972.67	F II
35	3948.40	Pt I	310	3955.36	Ce II	390	3964.50	Ce II	390	3972.71	Gd I
300	3948.44	U I	580	3955.73	Ho I	45	3964.54	Rh II	2700	3973.04	Er I
5	3948.56	F I	200	3955.73	Tc I	20	3964.729	He I	450	3973.26	O II
4500	3948.67	Ti I	10 h	3955.74	Si II	1600 c	3964.81	Pr II	1100	3973.30	Nd II
10000	3948.68	Cm I	60	3955.75	Eu I	10000	3964.83	Cm I	200	3973.48	Hf I
60	3948.774	Fe I	450	3955.85	N II	120	3964.90	Eu II	660	3973.50	Zr I
15	3948.90	Ca I	230	3956.06	Ce II	460	3964.90	Ru I	110	3973.56	Ni I
200	3948.964	Th II	980	3956.28	Ce II	100	3964.96	Os I	3200	3973.58	Er I
35	3948.979	Ar I	4500	3956.34	Ti I	160	3965.14	W I	100	3973.64	V II
9000	3949.10	La II	320	3956.42	Er I	500	3965.19	Cs II	740	3973.69	Nd II
30	3949.13	Eu II	60	3956.454	Fe I	15	3965.43	Zn I	18	3973.71	Ca I
1500	3949.27	Tm I	250	3956.68	Fe I	250	3965.69	Nb I	590	3973.98	Gd II
900 c	3949.43	Pr II	380	3956.75	Pr II	620	3966.04	Sm II	620	3974.66	Sm I
60	3949.43	Ag II	17	3957.05	Ca I	910 d	3966.09	Nb I	1400	3974.72	Er II
500	3949.51	Ba II	300	3957.10	Ce III	30	3966.23	Au I	170	3974.78	F II
60	3949.60	Eu I	240	3957.45	Nd II	590	3966.28	Gd I	300	3974.81	Gd I
100	3949.78	Os I	300	3957.641	P III	280	3966.35	Er I	320	3974.85	Pr II
60	3949.953	Fe I	1200	3957.67	Gd II	100	3966.36	Pt I	270	3975.07	Ce II
460	3950.21	Ru I	1000	3957.74	Pm II	600	3966.52	U II	200	3975.29	Zr I
100	3950.23	V I	800	3957.79	Dy II	560 c	3966.57	Pr II	380	3975.31	Rh I
4400	3950.36	Y II	10000 l	3957.85	Pa II	150	3966.59	Eu II	10000	3975.43	Pu II
540	3950.39	Dy II	40	3957.92	Eu II	60	3966.614	Fe I	110 h	3975.44	Os I
220	3950.56	Ho I	590	3958.00	Nd II	490	3966.66	Zr I	220	3975.88	Ho I
300	3950.59	Xe III	1500	3958.10	Tm II	6	3966.72	K II	55	3975.89	Mn I
350	3950.61	Br II	5200	3958.21	Ti I	770	3967.05	Ce II	25	3975.94	Te II
45	3950.76	Eu II	940	3958.22	Zr II	45	3967.18	Eu I	960	3976.27	Sm II
30	3951.10	Cr I	95	3958.24	Rh I	390	3967.392	Th I	590	3976.31	Ir I
2000	3951.16	Nd II	230	3958.27	Ce II	320	3967.51	Dy I	1000	3976.43	Sm II
50	3951.164	Fe I	350 d	3958.36	Tb II	470	3967.68	Sm II	30	3976.65	Au I
55	3951.33	Eu II	1500	3958.64	Pd I	160	3968.01	Hf I	1600	3976.66	Cr I
250	3951.48	Er I	30	3958.75	Sr III	590	3968.26	Gd II	280	3976.73	Er I
150	3951.60	Y II	3800	3958.86	Rh I	990	3968.26	Zr I	40 h	3976.74	Co II
410	3951.83	Hf I	230	3958.87	Ce II	14000	3968.39	Dy II	2200 d	3976.84	Tb II
470	3951.89	Sm I	10 h	3959.10	Au I	480	3968.46	Lu I	740	3976.85	Nd II
8	3951.92	Pb III	110	3959.300	Th I	220	3968.47	Ca II	390 c	3976.93	Ho I
140	3951.97	V II	750	3959.44	Gd II	130	3968.59	W I	810	3977.02	Er I
300	3952.00	Gd II	190	3959.44	Pr I	11	3968.72	Fe III	65	3977.08	Mn I
810	3952.20	Nd II	350	3959.50	Cs II	750	3969.00	Gd I	730	3977.23	Os I
45	3952.27	Sc I	230 c	3959.51	Ho II	120	3969.06	Cr I	10 h	3977.46	Si II
10	3952.36	Rn I		3959.52	Gd II	40	3969.22	Te II	80	3977.741	Fe I
40	3952.40	Cr I	370	3959.53	Sm II	100	3969.257	Fe I	150	3978.00	Cs II
120	3952.52	W I	490	3959.68	Ho I	600	3969.26	Sr I	1000 c	3978.15	Rb II
3100	3952.54	Ce II	8	3960.53	Ar III	270	3969.29	Gd II	350	3978.307	P III
1000 l	3952.58	Am II	770	3960.91	Ce II	9	3969.49	Fe III	60	3978.42	Eu I
50	3952.601	Fe I	200	3961.02	Os I	150	3969.67	Os I	600	3978.44	Ru I
3000 s	3952.62	Pa II	280	3961.04	Re I	1600	3969.75	Cr I	2700	3978.57	Dy II
310	3952.68	Ru I	9000 r	3961.520	Al I	300	3970.04	Sr I	770	3978.65	Ce II
50	3952.760	Th I	200	3961.59	O III	150bl	3970.05	HfO	85	3978.68	Cr I
65	3952.84	Mn I	510	3962.21	Nd II	3000 s	3970.07	Pa II	960	3979.20	Sm II
320	3952.87	Nd II	250 w	3962.35	In II	8	3970.072	H I	130	3979.29	W I
120	3952.90	W I	470	3962.45	Pr II	210	3970.10	Ta I	750	3979.33	Gd I
160	3953.15	W I	4	3962.48	Pb IV	740	3970.53	Sm II	20	3979.356	Ar II
35	3953.16	Cr I	350 c	3962.48	Re I	150 h	3970.80	W I	10 w	3979.42	Fe III
10000	3953.36	Cm I	370	3962.59	Dy I	500	3971.16	Pr II	600	3979.42	Ru I
590	3953.37	Gd I	950	3962.85	Ti I	85	3971.26	Cr I	740	3979.49	Nd II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
30	3979.63	Eu II	280	3987.53	Er I	30	3995.66	Ba I	400	4005.241	Fe I
300	3979.64	Tc I	810	3987.66	Er I	3600	3995.75	La II	1900	4005.47	Tb II
30	3979.68	Au I	400	3987.78	Tc I	270	3995.83	Pr II	370	4005.64	Ce II
40	3979.80	Cr I	470	3987.84	Gd I	110	3995.86	Al II	170	4005.71	V II
150	3980.089	Th I	32000	3987.99	Yb I	55	3995.98	Eu II	420	4005.84	Dy I
110 h	3980.14	Al III	100	3988.18	Os I	280	3995.98	Ru I	35	4005.97	Ti I
500	3980.35	Tc I	40	3988.24	Eu II	380	3996.15	Rh I	320	4006.07	Dy I
500	3980.38	Br II	4400	3988.52	La II	210	3996.17	Ta I	50	4006.52	Te II
150	3980.51	Pr III	45	3989.06	Sc II	700	3996.32	Gd II	190	4006.84	Ta I
130	3980.64	W I	370	3989.44	Ce II	1800	3996.52	Tm II	250	4007.021	Th II
500	3980.74	Pm II	1300 c	3989.68	Pr II	20	3996.57	Pt I	500	4007.14	Tc I
560	3980.88	Ce II	5700	3989.76	Ti I	5500	3996.61	Sc I	50	4007.36	Yb I
85	3981.23	Cr I	160	3989.99	Cr I	1600	3996.69	Dy II	410	4007.43	Nd II
5	3981.24	Si III	1500	3990.00	Sm II	200	3996.97	Tc I	470	4007.48	Sm II
100 h	3981.58	Ag I		3990.02	Sm I	560 c	3997.04	Pr II	210	4007.59	Ce II
200 h	3981.60	Zr I	1400	3990.10	Nd II	200	3997.392	Fe I	200	4007.60	Zr I
4800	3981.76	Ti I	460	3990.42	U II	10	3997.67	Yb III	14000	4007.96	Er I
20	3981.77	Te II	540	3990.57	V I	320	3997.76	Gd II	70	4008.06	Ti I
40	3981.771	Fe I	930	3990.88	Yb I	100 h	3997.793	Kr II	230	4008.18	Er II
3000	3981.82	Pa I	960	3991.12	Cr I	970	3997.91	Co I	220	4008.210	Th I
1800	3981.87	Tb II	770	3991.13	Zr II	230	3997.96	Pr II	320	4008.33	Gd I
1400	3981.92	Dy II	230	3991.15	Er I	10 h	3998.01	Si II	1900	4008.69	Pr II
10	3981.926	Cd I	540	3991.32	Dy II	40	3998.053	Fe I	8600	4008.75	W I
220	3982.20	O II	30	3991.37	Au I	50	3998.061	Th I	300	4008.91	Gd II
10000	3982.23	Pa I	50	3991.38	Lu I	350	3998.24	U II	950	4008.93	Ti I
1100	3982.33	Er I	700	3991.50	Cl III	150	3998.63	N III	220	4009.056	Th I
320	3982.36	Nd II	160	3991.67	Cr I	7800	3998.64	Ti I	280	4009.16	Er II
570	3982.48	Ti I	110	3991.730	Th I	430	3998.73	V I	1	4009.27	He I
130	3982.58	Mn I	1000	3991.74	Nd II	300	3998.84	Tm III	190	4009.66	Ti I
3600	3982.60	Y II	10	3991.74	Yb III	1000 r	3998.96	Pm II	40	4009.70	Er III
560	3982.89	Ce II	15 h	3991.77	Si II	770	3998.97	Zr II	60	4009.713	Fe I
10	3983.02	Co II	230	3991.91	Pr II	320	3999.12	Pr II	500	4009.96	Pm II
740	3983.14	Sm II	460	3992.12	Ir I	2800	3999.24	Ce II	300	4010.04	Tb I
310	3983.29	Ce II	10 h	3992.15	Ag I	100	3999.28	Ta I	620	4010.60	Pr II
250	3983.29	W I	340	3992.16	Pr II	70	3999.36	Ti I	540	4011.29	Dy II
1600	3983.65	Dy II	1500	3992.36	Br I	350	3999.40	Tb II	180	4011.69	Eu II
200	3983.839	Hg II	700	3992.39	Ce II	380	3999.58	Ho I	20	4011.69	Te II
300	3983.85	Tb II	380	3992.53	U II	620 c	4000.17	Pr II	1000	4012.00	Tc I
960	3983.91	Cr I	320	3992.69	Gd I	200	4000.20	Pr III	5	4012.10	K II
50	3983.956	Fe I	260	3992.80	V I	8000	4000.45	Dy II	3700	4012.25	Nd II
200	3983.96	Hg II	190	3992.84	Cr I	410	4000.50	Nd II	200	4012.25	Zr I
800	3984.21	Dy II	370	3992.91	Ce II	7	4001.24	K II	2700	4012.39	Ce II
1	3984.21	Mg I	25	3993.06	Ba III	470	4001.26	Gd II	70	4012.39	Ti II
60	3984.33	Ti I	220	3993.21	Gd II	160	4001.44	Cr I	120	4012.47	Cr II
190	3984.34	Cr I	150	3993.302	Cu II	230	4001.56	Ce II	280	4012.495	Th I
240	3984.40	Rh I	740	3993.31	Sm II	350 d	4002.19	Tb II	3	4012.57	Au I
770	3984.68	Ce II	80	3993.40	Ba I	70	4002.49	Ti I	1100	4012.58	Er I
870	3984.86	Ru I	10000 l	3993.57	Cf II	160cw	4002.59	Ho II	540	4012.70	Nd II
10000 c	3984.97	Tc I	220	3993.73	Ho II	970	4002.59	Tb II	200	4012.72	Pm II
70	3985.19	Ag II	910	3993.82	Ce II	240	4003.309	Th II	760	4012.75	Tb II
150	3985.24	Mn I	30	3993.93	Eu II	220	4003.39	Ho I	3000 l	4012.96	Pa II
35	3985.25	Ti I	40	3993.97	Cr I	280	4003.46	Sm II	330	4013.26	Tb I
10	3985.48	Li I	300	3994.04	Tc I	140	4003.476	Cu II	110	4013.50	Ho I
10	3985.54	Li I	60	3994.114	Fe I	150	4003.48	Os I	180	4013.58	Ti I
100	3985.56	Yb III	650	3994.16	Gd II	200	4003.58	N III	300	4013.80	Gd II
60	3985.59	Ti I	2000	3994.51	Tc I	60	4003.71	Eu II	540	4013.82	Dy I
220cw	3985.71	Ho II	530	3994.549	Th II	910	4003.77	Ce II	50	4013.857	Ar II
1200	3985.79	U II	1100	3994.68	Nd II	70	4003.81	Ti I	140 d	4013.92	In II
470	3986.25	Nd II	35	3994.70	Ti I	540	4004.02	Nd II	320	4014.20	Ho II
55 h	3986.60	Eu I	1600	3994.79	Pr II	100	4004.02	Os I	250	4014.20	Pm II
740	3986.68	Sm II	35	3994.792	Ar II	230	4004.05	Er I	530	4014.49	Sc II
8	3986.75	Mg I	100	3994.840	Kr II	350	4004.06	U II	80	4014.53	Fe I
190	3986.83	Mn I	1000	3995.00	N II	120 c	4004.66	In II	30	4014.67	Cr I
300 l	3986.89	Np I	300	3995.05	Pm II	300	4004.69	Tc I	540	4014.70	Dy II
120	3987.024	Cu II	10000	3995.10	Cm I	730	4004.70	Pr II	910	4014.90	Ce II
150	3987.10	Mn I	6	3995.10	K II	100	4004.93	Re I	540	4015.22	W I
450	3987.21	Gd II	6000	3995.31	Co I	260	4004.94	Gd II	70	4015.38	Ti I
370	3987.43	Sm II	440	3995.58	Tm II	150	4005.16	Os I	180	4015.39	La I
40	3987.50	Y I	240	3995.61	Rh I	430	4005.21	U I	730	4015.39	Pr II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
350	4015.57	Er II	400	4023.98	Zr I	730 c	4031.75	Pr II	120	4039.19	Eu I
200	4015.58	Gd I	300	4024.04	Br II	10000	4031.76	Cm I	310	4039.21	Ru I
250	4015.88	Ce II	220	4024.23	Tm I	180 c	4031.80	Ho I	1000	4039.25	Tc I
10	4016.07	Au II	840	4024.49	Ce II	1200	4031.82	Nd II	470	4039.34	Pr II
10000	4016.17	Cm I	1200	4024.57	Ti I	120	4031.83	V I	250	4039.53	Nb I
35	4016.28	Ti I	240	4024.73	F II	700	4032.13	Tm III	3800	4039.60	Y III
170 h	4016.52	W I	370	4024.77	Tb I	180	4032.27	Hf I	940	4039.83	Y I
400	4016.68	Tc I	340	4024.78	Nd II	870	4032.28	Tb I	140	4039.85	W I
300	4016.91	Gd III	770	4024.92	Zr I	150	4032.32	In III	4	4040.02	Co II
600	4017.22	Tc I	70	4025.01	Cr I	300	4032.38	Sr I	130	4040.08	Ir I
300	4017.25	Gd I	220	4025.01	F II	520	4032.47	Dy II	3000	4040.11	Y III
150	4017.58	Eu II	40	4025.14	Ti II	230	4032.47	Pr II	35 h	4040.32	Ti I
430	4017.71	Gd I	240	4025.15	Ce II	1100	4032.52	Nb I	50	4040.638	Fe I
570	4017.72	U II	110	4025.39	Ho I	100	4032.647	Cu II	2100	4040.76	Ce II
120 h	4017.77	Ti I	230	4025.49	F II	10	4032.99	Ga I	3000	4040.80	Nd II
160 c	4018.09	Ho II	360	4025.54	Pr II	2100	4033.03	Tb II	2700	4040.81	Ho I
1500	4018.10	Mn I	210	4025.656	Th II	10	4033.03	Yb III	120	4040.87	Ta I
3000 s	4018.21	Pa II	250	4025.88	La II	19000	4033.07	Mn I	400	4040.93	Au I
160	4018.26	Os I	200	4026.03	Tm III	220	4033.31	Re I	200	4041.06	Nd II
90	4018.36	Pr III	120	4026.17	Cr I	700	4033.49	Gd I	240	4041.204	Th II
600	4018.50	Cl III	50	4026.191	He I	200	4033.55	Sb I	550	4041.31	N II
370	4018.81	Nd II	5	4026.36	He I	20	4033.56	Sb II	5600	4041.36	Mn I
300	4018.99	U II	150	4026.44	Mn I	420	4033.65	Dy II	590	4041.68	Sm II
200	4019.04	Ce II	190 h	4026.54	Ti I	350	4033.76	Ir I	200	4041.78	Tc I
4200	4019.129	Th II	230	4026.83	Pr II	50	4033.809	Ar II	280	4041.92	Os I
370	4019.14	Tb II	190	4026.94	Ta I	960	4033.83	Pr II	320	4041.98	Dy II
220	4019.23	W I	140	4027.009	Th I	40	4033.91	Ti I	240	4042.22	Zr I
200	4019.34	Pm II	85	4027.10	Cr I	100	4034.23	Sc I	910	4042.58	Ce II
15000	4019.632	Pb I	990	4027.20	Zr I	230	4034.33	Pr II	6	4042.59	K II
300	4019.73	Gd I	320	4027.21	Ho I	11000	4034.49	Mn I	120	4042.64	V I
280	4019.98	Sm II	40	4027.48	Ti I	30	4034.91	Ti I	740	4042.72	Sm II
180	4020.03	Ir I	220	4027.61	Gd I	360	4035.08	N II	1000	4042.75	U I
100 s	4020.25	Am I	420	4027.78	Dy II	740	4035.11	Sm II	150	4042.894	Ar II
20000	4020.40	Sc I	2000	4028.14	Yb III	340	4035.40	Gd I	880	4042.90	Sm II
540	4020.47	Tb II	1100	4028.15	Gd I	10	4035.42	Fe III	3000	4042.91	La II
3000	4020.51	Er I	250	4028.20	Pm II	10000	4035.45	Cf	230	4043.01	Er II
2000	4020.76	Tc I	520 d	4028.32	Dy II	20	4035.460	Ar II	600	4043.484	Cu II
1000	4020.87	Nd II	40	4028.34	Ti II	150	4035.63	V II	360	4043.53	N II
350	4020.90	Co I	840	4028.41	Ce II	1500	4035.73	Mn I	610	4043.58	Zr I
620	4020.96	Pr II	180	4028.79	W I	100 s	4035.81	Am I	410	4043.59	Nd II
1000	4021.34	Nd II	270	4028.86	Ho I	110	4035.83	Ti I	410	4043.71	Gd I
450	4021.55	Er I	240	4028.95	Zr I	400	4035.89	Zr I	500	4043.751	Cu II
1000	4021.78	Nd II	230	4029.00	Pr II	250	4036.047	Th I	220	4043.80	Sc I
140	4021.83	Ti I	100	4029.12	Cd II	10 h	4036.14	Co II	240	4044.11	Sm II
100	4021.867	Fe I	1700	4029.49	Rb II	350	4036.22	Tb I	18	4044.14	K I
200	4021.92	Tm III	180	4029.60	Pr III	300	4036.26	Ba II	140 h	4044.28	W I
130	4022.12	W I	110 c	4029.63	Re I	420	4036.32	Dy II	520	4044.41	U II
1500	4022.16	Ru I	400	4029.68	Zr II	500 s	4036.37	Am II	50	4044.418	Ar I
85	4022.26	Cr I	360 c	4029.72	Pr II	240	4036.565	Th II	380	4044.47	Tm I
240	4022.27	Ce II	30	4029.73	Te II	260	4036.84	Gd I	490	4044.56	Zr I
300	4022.33	Gd II	140	4029.94	Ta I	180	4036.86	W I	1300	4044.81	Pr II
1250	4022.63	Cu I	490	4030.04	Zr I	185	4037.2	As III	1600	4045.01	Gd I
470	4022.71	Pr II	3000	4030.16	Pa II	140	4037.21	La I	560	4045.05	Sm II
160 c	4022.76	Ho II	250	4030.34	Ce II	1400	4037.33	Gd II	210 d	4045.13	Mn I
220	4022.88	Tb I	1300	4030.38	Sr I	20 h	4037.37	Co II	230	4045.21	Ce II
140	4022.96	Re I	410	4030.47	Nd II	110	4037.49	Re I		4045.21	Mn I
1200	4023.00	Nd II	190 h	4030.51	Ti I	100	4037.59	Xe II	200	4045.36	Pm II
1100	4023.14	Gd I	220	4030.67	Sc I	220	4037.62	Ho I	370	4045.39	Co I
120	4023.14	Rh I	85	4030.68	Cr I	340	4037.67	Ce II	5400 c	4045.44	Ho II
880	4023.23	Sm II	27000	4030.76	Mn I	100	4037.84	Os I	910	4045.59	W I
100	4023.31	Re I	250	4030.842	Th I	700	4037.90	Gd II	400	4045.61	Zr II
810	4023.35	Gd I	860	4030.88	Gd I	2 h	4038.06	Si IV	230	4045.70	Pr II
120	4023.39	V II	3	4031.16	Pb III	270	4038.12	Nd II	4000	4045.813	Fe I
6	4023.60	Ar III	840	4031.34	Ce II	230	4038.22	Pr II	12000	4045.97	Dy I
20000	4023.69	Sc I	140	4031.39	Sc I	730	4038.45	Pr II	440	4046.16	Sm II
370	4023.71	Dy I	1 h	4031.39	Si IV	55	4038.73	Mn I	620	4046.34	Ce II
100	4023.77	In III	20000 c	4031.63	Tc I	210	4038.86	Tb I	200	4046.48	Sc I
600	4023.83	Ru I	520	4031.66	Tb II	220 c	4038.87	Ho II	1800	4046.56	Hg I
160 c	4023.94	Ho II	2800	4031.69	La II	190	4039.10	Cr I	1800	4046.572	Hg I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
230	4046.63	Pr II	810	4053.29	Gd II	350	4060.79	Nb I	520	4068.35	Gd I
360	4046.7	Se III	40	4053.44	Rh I	220	4060.87	Tb II	760	4068.37	Ru I
270	4046.84	Gd II	700	4053.51	Ce II	4700	4061.09	Nd II	100	4068.66	Sc III
3000 s	4046.93	Pa II	2600	4053.64	Gd I	80	4061.21	Sc III	260	4068.74	Gd I
1000	4046.96	Er I	18 p	4053.71	Ba III	270	4061.30	Gd II	500	4068.77	Cs II
340	4047.08	Pr II	8100	4053.93	Ho I	410	4061.40	Ta I	210	4068.80	Pr II
270	4047.09	Gd I	200	4053.96	Cs II	330	4061.53	Zr I	420	4068.84	Ce II
740	4047.16	Sm II	710	4054.05	Ru I	1300	4061.58	Tb I	250	4068.91	C III
40	4047.17	Te II	430	4054.12	Tb I	400 s	4061.60	Ac II	300	4069.201	Th II
350	4047.18	Cs II	300	4054.30	U II	730	4061.74	Mn I	1100	4069.28	Nd II
17	4047.21	K I	670	4054.45	Lu I	1400	4062.08	Mo I	100	4069.461	Th I
220 c	4047.52	Ho I	540	4054.48	Ho II	14000	4062.136	Pb I	150	4069.79	W I
410	4047.61	U I	5500	4054.55	Sc I	280	4062.22	Ce II	2300	4069.88	Mo I
2400	4047.64	Y I	2	4054.69	Mg I	230	4062.22	Pr II	160	4069.90	O II
2700	4047.79	Sc I	810	4054.72	Gd I	50	4062.30	In III	370	4069.92	Ir I
100	4047.96	Hf II	2200	4054.88	Pr II	880	4062.54	U II	730	4069.95	W I
160	4048.05	Os I	450	4054.99	Ce II	650	4062.59	Gd II	285	4070.2	Se II
55	4048.287	Th I	290	4055.02	Ti I	2000	4062.64	Cu I	250	4070.26	C III
10000	4048.29	Cm I	770	4055.03	Zr I	20 h	4062.73	Co II	290	4070.28	Mn I
280	4048.34	Er II	520	4055.14	Dy II	3400	4062.81	Pr II	750	4070.29	Gd II
60	4048.41	Rh I	600 r	4055.20	Pm II	230	4062.84	Hf I		4070.39	Gd II
210	4048.62	Sm II	150	4055.21	Mn I	230	4062.94	Ce II	10000 s	4070.40	Pa II
610	4048.67	Zr II	940	4055.47	Er II	1900	4063.39	Gd II	340	4070.61	W I
1100	4048.76	Mn I	100 h	4055.48	Ag I	250	4063.407	Th I	150	4070.68	Ir I
160	4048.78	Cr I	1900	4055.54	Mn I	730	4063.53	Mn I	250	4070.86	Os I
410	4048.81	Nd II	600	4055.71	Zr I	560	4063.54	Sm II	410	4071.12	U II
30	4048.88	Te II	270	4056.01	Mo I	540	4063.59	Gd II	230	4071.54	V I
200	4048.99	Re I	150	4056.06	C III	1500	4063.594	Fe I	190	4071.56	Os I
80	4049.00	Mn I	200 c	4056.08	Tc I	220	4063.89	Tb II	100	4071.57	In III
23	4049.04	Rh I	10000 s	4056.20	Pa II	230	4063.93	V I	1200	4071.737	Fe I
10000 c	4049.11	Tc I	23	4056.34	Rh I	1500	4064.16	Zr I	1100	4071.81	Ce II
270	4049.20	Gd I	2200	4056.54	Pr II	200	4064.22	Ti I	270	4071.83	Ho I
1300	4049.43	Gd II	200 r	4056.56	Pm I	280	4064.32	Sm II	100	4071.93	W I
200	4049.49	Er II	220	4056.59	Sc I	370	4064.46	Ru I	200	4072.005	Ar II
10000	4049.65	Cm I	410 w	4056.94	In II	2 h	4064.50	Co II	285	4072.16	O II
4	4049.80	Pb IV	300	4057.037	Kr II	1400	4064.58	Sm II	70	4072.385	Ar II
590	4049.81	Sm II	280	4057.07	V I	210	4064.63	Ta I	2000	4072.70	Zr I
2200	4049.86	Gd II	200	4057.440	P III	160	4064.79	La I	270	4072.92	Ce II
120	4049.95	Sc I	200 l	4057.46	Xe II	180	4064.79	W I	100	4072.93	In III
1600	4050.04	U II	10	4057.50	Mg I	700	4065.07	Au I	200	4073.00	Ru I
200	4050.07	Xe III	270	4057.55	Ho I	80	4065.08	Mn I	2500	4073.12	Dy II
320	4050.08	La II	85	4057.62	Ti I	1700	4065.09	Ho II	270	4073.13	Ho I
5 h	4050.23	Co II	150	4057.76	N IV	200	4065.10	Ti I	650	4073.20	Gd II
200	4050.33	Zr II	95000	4057.807	Pb I	300	4065.128	Kr II	70	4073.36	Cs II
270	4050.37	Gd I	130	4057.82	V I	40	4065.72	Cr I	1800	4073.48	Ce II
200	4050.48	Zr I	210	4057.95	Mn I	260	4066.04	Gd I	15	4073.48	Te II
1600	4050.56	Dy II	85	4058.14	Ti I	140	4066.21	Hf I	290	4073.51	Ho I
110	4050.887	Th I	430	4058.19	U II	390	4066.22	Tb II	210	4073.74	Ce II
360	4050.96	V I	2600	4058.22	Gd I	350	4066.37	Co I	300	4073.76	Gd II
450	4051.13	Pr II	120	4058.77	Cr I	960	4066.69	Os I	5 h	4074.34	Co II
850	4051.15	Nd II	450	4058.80	Pr II	810	4066.74	Sm II	5000	4074.36	W I
360	4051.35	V I	440	4058.87	Sm II	85	4066.94	Cr I	300	4074.48	U II
1400	4051.40	Ru I	1100	4058.93	Mn I	50	4066.975	Fe I	250	4074.52	C II
210	4051.43	Ce II	16000 c	4058.94	Nb I	100	4067.24	Ta I	20	4074.53	Yb III
300	4051.54	Pm II	600	4059.07	Cl III	280	4067.28	Ce II	230	4074.68	Os I
55	4051.73	Mn I	140	4059.253	Th I	50	4067.37	Kr III	35	4074.86	Cr I
300	4051.86	Tb II	400	4059.312	P III	850	4067.39	La II	310	4074.93	Zr I
540	4051.91	U II	150	4059.39	Mn I	170	4067.57	Ho I	160 h	4074.97	Sc I
500	4051.95	Tc I	550	4059.51	Er I	200	4067.61	Ru I	3	4075.06	Mg I
200	4051.98	Po	210	4059.51	Nb I	520	4067.75	U II	710	4075.12	Nd II
210	4051.99	Ce II	690	4059.78	Er II	310	4067.91	Ta I	260	4075.22	Tb I
70	4052.28	Yb I	650	4059.88	Gd I	200	4067.94	C III	470	4075.28	Nd II
10 h	4052.40	Co II	850	4059.96	Nd II	500	4067.96	Cs II	20 h	4075.45	Si II
65	4052.47	Mn I	10	4060.21	Ti III	50	4067.977	Fe I	55	4075.503	Th I
30	4052.79	Au II	410	4060.26	Ti I	80	4068.00	Mn I	1500	4075.71	Ce II
300	4052.87	Tb II	220	4060.31	Ho I	720	4068.05	Ho I	600	4075.84	Pm II
100	4052.921	Ar II	220	4060.33	La I	120	4068.106	Cu II	810	4075.84	Sm II
11	4053.11	Fe III	410	4060.37	Tb I	210	4068.26	Nb I	1500	4075.85	Ce II
200	4053.18	Tc I	60	4060.4	Xe III	710	4068.33	Sm II	350 l	4075.85	C II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
450	4075.87	O II	560	4082.78	Rh I	100	4090.49	Cu III	440	4100.40	Nb I
40	4076.06	Cr I	1100	4082.94	Mn I	1100	4090.58	V I	350	4100.56	Er II
100	4076.15	Tm III	150	4082.96	W I	20	4090.67	Yb III	2900 c	4100.72	Pr II
210	4076.24	Ce II	150	4083.18	P V	140	4091.64	Ho I	40	4100.737	Fe I
10	4076.35	Au II	220	4083.2	Se III	490	4091.82	Os I	6700	4100.92	Nb I
200	4076.53	Zr I	910	4083.23	Ce II	210	4092.19	Tb I	30	4101.04	Te II
25	4076.628	Ar II	3	4083.28	Au II	1000	4092.27	Sm II	30	4101.70	Au I
40	4076.629	Fe I	500	4083.34	Pr II	830	4092.39	Co I	15	4101.74	H I
280	4076.65	Sm II	180	4083.35	Hf I	180	4092.41	V I	350	4101.74	Ru I
330	4076.69	U II	10 h	4083.43	Ag I	100	4092.61	Ir I	17000	4101.76	In I
110	4076.71	La II	400	4083.54	Tc I	1800	4092.69	V I	450	4101.77	Ce II
980	4076.73	Ru I	280	4083.58	Sm II	1100	4092.71	Gd I	5 h	4101.86	Si III
15 h	4076.78	Si II	1100	4083.63	Mn I	210	4092.90	Er I	10000	4101.96	Pu I
40	4077.09	Cr I	230	4083.67	Ho I	460	4093.03	U II	250	4102.15	Mo I
3	4077.14	I III	520	4083.70	Gd I	40 h	4093.13	Sc I	590	4102.16	V I
85	4077.28	Yb II	2000	4083.71	Y I	540	4093.16	Hf II	200	4102.23	I I
2800	4077.35	La II	200	4083.77	Ba II	120	4093.50	V I	9900	4102.38	Y I
9400	4077.38	Y I	2500 c	4083.88	Rb II	5	4093.69	K II	8	4102.42	Si III
420	4077.47	Ce II	160	4083.91	F II	200	4093.69	Tc I	1000	4102.70	W I
70	4077.57	Rh I	80 d	4083.91	O II	260	4093.72	Gd I	70	4102.936	Si I
240	4077.62	Nd II	100	4084.10	Au I	30	4094.03	Sr III	190	4103.07	F II
40	4077.68	Cr I	19	4084.28	Rh I	290	4094.05	Sm II	170	4103.22	F II
46000	4077.71	Sr II	940	4084.38	Mo I	10000	4094.19	Tm I	3900	4103.30	Dy II
150	4077.83	Hg I	220	4084.40	Sm II	260	4094.37	Tb II	200	4103.43	N III
150	4077.838	Hg I	30 h	4084.86	Ba I	260	4094.48	Gd II	200	4103.51	F II
420	4077.88	Er I	270	4084.86	Nb I	260	4094.49	Tb I	180	4103.71	F II
7400	4077.96	Dy II	140	4085.09	Ho I	3	4094.54	Pb III	8900	4103.84	Ho I
45 h	4078.24	Eu I	450	4085.23	Ce II	700	4094.747	Th II	860	4103.87	Dy I
240	4078.31	Zr I	200 r	4085.31	Pm I	120	4094.78	Ho I	170	4103.87	F II
530	4078.32	Ce II	370	4085.34	Dy I	65	4094.85	Sc I	260	4103.90	Tb II
1300	4078.44	Gd II	120	4085.38	Eu II	110	4094.95	P V	150	4103.912	Ar II
840	4078.47	Ti I	310	4085.43	Ru I	890	4095.49	V I	240	4104.13	Sm II
270	4078.52	Ce II	85	4085.434	Th I	15000	4095.67	Tc I	500	4104.23	Cl III
160	4078.57	Sc I	1500	4085.56	Gd II	100	4095.69	W I	110	4104.23	Hf I
2800	4078.70	Gd I	240	4085.82	Nd II	390	4096.10	Dy I	2000 c	4104.28	Rb II
40 h	4079.1	Bi II	80	4085.91	Ag II	75bl	4096.13	LuO	230	4104.40	V I
120	4079.18	La I	500	4086.10	Pm II	270	4096.13	Nd II	140	4104.42	Re I
730	4079.24	Mn I	700	4086.520	Th II	1	4096.57	Co II	260	4104.78	V I
730	4079.42	Mn I	210	4086.60	Tb I	75	4096.80	Eu II	20	4104.79	Cl I
35	4079.574	Ar II	200	4086.67	Sc I	560	4096.82	Pr II	40	4104.87	Cr I
40	4079.72	Ti I	5500	4086.72	La II	30	4097.02	Sr III	110	4104.87	La I
12000	4079.73	Nb I	50 d	4087.14	O II	50	4097.10	Ca II	250	4105.00	Ce II
500 c	4079.77	Pr II	400	4087.16	Sc I	10000	4097.12	Pu I	220	4105.00	O II
300	4080.084	P III	200 c	4087.21	Pr II	10	4097.2	Bi II	120	4105.02	Ta I
120 c	4080.23	Ho II	290	4087.34	Pd I	110	4097.24	O II	120	4105.04	Ho I
470	4080.23	Nd II	170	4087.35	Ho I	250	4097.33	N III	2800	4105.17	V I
270	4080.44	Ce II	250	4087.36	Ce II	140	4097.52	Rh I	270	4105.330	Th II
240	4080.56	Sm II	200	4087.59	Ho I	930	4097.79	Ru I	55	4105.36	Mn I
6000	4080.60	Ru I	3500	4087.63	Er I	1100	4098.10	Er I	650	4105.37	Tb I
330	4080.60	U II	260	4087.69	Gd II	220	4098.18	Nd II	30	4105.63	Sr III
500 c	4080.98	Pr II	45	4087.79	Rh I	20	4098.23	Yb III	9500	4105.84	Tm I
12	4081.00	Fe III	130	4088.33	W I	55 h	4098.35	Sc I	10000	4105.95	Pu II
670	4081.22	Ce II	500	4088.337	Kr II	380	4098.40	Pr II	380	4106.38	U II
90 h	4081.22	Y I	3000 s	4088.44	Ac II	15	4098.53	Ca I	60 h	4106.39	Y I
2000	4081.22	Zr I	60	4088.50	Rh I	15	4098.57	Ca I	270	4106.50	Ho I
550	4081.24	Er II	2	4088.58	Er III	2600	4098.61	Gd II	140	4106.58	Hf I
390	4081.24	Tb I	150	4088.61	Al III	250	4098.729	Kr II	200	4106.59	Nd II
110	4081.368	Th I	10000	4088.71	Tc I	100 h	4098.89	Xe II	500	4106.83	Cl III
200	4081.37	Na II	70	4088.726	Th I	520	4098.90	Gd II	60	4106.88	Eu I
240	4081.43	Re I	230	4088.85	Ce II	10000	4099.12	Cf I	810	4107.28	Sm II
1300	4081.44	Mo I	10	4088.85	Si IV	85	4099.17	Ti I	100	4107.36	Ho I
15	4081.77	Ca III	150 d	4089.27	O II	280	4099.54	La II		4107.39	Sm II
2	4081.83	Mg I	5000 s	4089.29	Am II	2800	4099.80	V I	510	4107.42	Ce II
790	4081.85	Pr II	100 l	4089.32	Am II	140	4099.94	N I	35 h	4107.44	Lu I
25	4082.387	Ar II	180	4089.61	La I	230	4100.22	Ho I	730	4107.47	Mo I
6100	4082.40	Sc I	440	4089.68	Yb I	650	4100.26	Gd I	40	4107.489	Fe I
110	4082.45	Al III	65	4089.94	Mn I	120	4100.30	Os I	45	4107.49	Rh I
290	4082.46	Ti I	2200	4090.13	U II	65	4100.33	Sc I	40	4108.05	Hg I
410	4082.60	Sm II	650	4090.41	Gd I	150	4100.341	Th I	40	4108.057	Hg I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
120	4108.22	V I	200	4117.29	Ce II	410	4123.88	Nd II	600	4131.50	Er I
200	4108.40	Zr I	200	4117.59	Ce II	710	4123.96	Sm II	300	4131.724	Ar II
840	4108.421	Th II	3000	4117.62	Pa	100	4123.99	O V	150 c	4131.79	Lu I
2900	4108.62	Ho I	150	4118.05	W I	120	4124.07	V I	100	4132.00	Cs II
1400	4109.08	Nd II	770	4118.14	Ce II	8000	4124.22	Tc I	3100	4132.02	V I
100	4109.1	Xe III	180	4118.18	V I	180	4124.60	Os I	400	4132.058	Fe I
170	4109.16	F II	100	4118.19	W I	490	4124.63	Dy II	1100	4132.28	Gd II
100	4109.248	Kr II	1700 c	4118.46	Pr II	3100	4124.73	Lu I	20	4132.43	Ba I
410	4109.40	Sm II	150	4118.544	Fe I	410	4124.73	U II	10000 h	4132.50	Cl II
2500	4109.46	Nd II	320	4118.55	Er I	510	4124.79	Ce II	40	4132.56	Li I
40	4109.58	Cr I	1900	4118.55	Sm II	320	4124.92	Y II	40	4132.62	Li I
150	4109.75	W I	110	4118.60	Hf I	100	4125.16	W I	120	4132.69	Tm II
2300	4109.79	V I	180	4118.64	V I	1300	4125.65	Ho I	340	4132.753	Th II
60	4109.82	Ca II	110	4118.69	Pt I	140	4126.52	Cr I	160	4132.81	O II
7	4109.85	Tl III	2800	4118.77	Co I	150	4126.80	W I	440 h	4133.00	Sc I
185	4109.95	N I	250	4119.02	Ce II	4300	4127.16	Ho I	10000	4133.01	Pu I
280	4110.19	Sm II	10	4119.14	Ti III	75	4127.28	Eu I	470	4133.36	Nd II
1000	4110.22	Tc I	150	4119.21	F II	35	4127.30	Cr I	240cw	4133.42	Re I
30	4110.28	Ca II	285	4119.22	O II	70	4127.32	Te II	100	4133.48	W I
200	4110.38	Ce II	120 h	4119.25	Yb II	980	4127.37	Ce II	200	4133.61	Pr II
510	4110.48	Nd II	600	4119.27	Tc I	200	4127.411	Th I	20	4133.63	Sb II
550	4110.54	Co I	60	4119.29	Cs II	130	4127.54	Ti I	14	4133.78	Ti IV
5	4110.76	Pb II	45	4119.30	Eu II	40	4127.608	Fe I	2700	4133.80	Ce II
80	4110.81	Y I	230	4119.46	V I	40	4127.64	Cr I	390	4133.85	Dy I
240 c	4110.89	Re I	120	4119.68	Rh I	250	4127.74	Ce II	200	4134.067	Th I
200	4110.90	Mn I	310	4119.79	Ce II	150	4127.80	Hf II	100 d	4134.15	I I
10000	4111.07	Pu I	310	4119.88	Ce II	23	4127.92	Ir I	750	4134.16	Gd I
1500	4111.34	Dy II	260	4119.92	Tb I	200	4128.07	Ce II	2300	4134.49	V I
250	4111.39	Ce II	630	4120.10	Mo I	300 h	4128.07	Si II	300	4134.54	Ho I
390	4111.44	Gd II	1500	4120.20	Ho I	3100	4128.07	V I	80	4134.676	Fe I
8900	4111.78	V I	180	4120.54	V I	2	4128.11	Pb III	7	4134.72	K II
100	4111.82	W I	40	4120.61	Cr I	10000	4128.12	Pu I	200	4134.77	Cd II
300	4112.00	Ho I	450	4120.8	S I	390	4128.24	Dy II	300	4134.81	Tc I
1200	4112.02	Os I	12	4120.82	He I	1000	4128.27	Tc I	120	4135.04	Mn I
90 h	4112.04	Eu II	450	4120.83	Ce II	8900	4128.31	Y I	70	4135.09	Yb II
120	4112.33	V I	100	4120.85	W I	410	4128.34	U II	250	4135.14	Sm II
300	4112.50	Tb I	10	4120.90	Fe III	30	4128.59	Au I	2100	4135.27	Rh I
95 h	4112.67	Lu I	2	4120.99	He I	120	4128.86	V I	510	4135.33	Nd II
220	4112.71	Ti I	15	4121.06	Yb III	1500	4128.87	Rh I	270	4135.44	Ce II
100	4112.72	Ho I	500	4121.21	Cs II	180	4128.96	Os I	300	4135.66	Br II
1900	4112.74	Ru I	4400	4121.32	Co I	350	4129.12	Dy I	2500	4135.78	Os I
240	4112.754	Th I	410	4121.36	Sm II	250	4129.15	Pr II	10000	4135.97	Pu I
10	4113.21	Zn I	400	4121.46	Zr I	40	4129.17	Ti I	1700 c	4136.11	Rb II
10000	4113.29	Cm I	140	4121.53	Bi I	200	4129.21	I I	230	4136.20	Ta I
4	4113.35	Pb II	120 h	4121.61	Y III	280	4129.23	Sm II	1500	4136.22	Ho I
230	4113.52	V I	190	4121.64	Re I	3	4129.24	La III	1800	4136.45	Re I
110	4113.53	Hf II	1100	4121.68	Rh I	210	4129.38	Ta I	30	4136.59	Eu II
300	4113.70	Na II	40	4121.82	Cr I	990	4129.42	Dy II	40	4136.997	Fe I
300 h	4113.83	Nd II	140	4121.86	Bi I	670	4129.43	Nb I	110	4137.04	La I
270 c	4113.89	Pr II	285	4121.93	B II	33000cw	4129.70	Eu II	40	4137.07	Eu I
410	4113.90	Sm II	11	4122.02	Fe III	10000	4129.71	Cm I	410	4137.10	Gd II
10000	4114.91	Pu I	70	4122.07	Hg III	770	4129.93	Nb I	2300	4137.10	Nb I
6	4114.99	K II	35	4122.16	Cr I	10000	4129.93	Pu II	140	4137.29	Ti I
10000	4115.08	Tc I	85	4122.17	Ti I	350	4130.35	Dy I	5	4137.43	La III
4300	4115.18	V I	310	4122.49	Lu I	2200	4130.37	Gd II	540	4137.46	W I
420	4115.37	Ce II	280	4122.51	Sm II	1500 h	4130.66	Ba II	270	4137.47	Ce II
5 h	4115.50	Si III	11	4122.78	Fe III	530	4130.71	Ce II	2000	4137.65	Ce II
280	4115.758	Th I	250	4123.08	Na II	340	4130.77	Pr II	15	4137.76	Fe III
140	4115.78	Ir I	180	4123.19	V I	3	4130.88	Co II	150	4137.84	Os I
9	4116.10	Si IV	4400	4123.23	La II	500 h	4130.89	Si II	150	4138.02	W I
810	4116.10	U II	510	4123.24	Ce II	110	4131.002	Th I	270	4138.10	Ce II
70	4116.33	Rh I	40	4123.31	Ti I	480	4131.10	Ce II	1100	4138.33	Tm I
320	4116.36	Er I	40	4123.39	Cr I	150	4131.12	Mn I	210	4138.35	Ce II
1800	4116.47	V I	510	4123.49	Ce II	13	4131.22	Ti IV	300	4139.12	Tc I
160	4116.54	F II	85	4123.57	Ti I	40	4131.25	Ti I	130	4139.34	Ho I
1100	4116.713	Th II	2000	4123.57	V I	40	4131.33	Kr III	13	4139.35	Fe III
270	4116.73	Ho I	30	4123.600	Th I	40	4131.36	Cr I	440	4139.44	Nb I
310	4116.90	Nb I	5300	4123.81	Nb I	500	4131.363	Cu II	2700	4139.71	Nb I
250	4117.01	Ce II	980	4123.87	Ce II	270	4131.48	Gd II	800	4139.85	Tc I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
10000	4140.04	Pu I	80	4148.80	Mn I	200 l	4158.04	Xe II	240	4169.09	Tb I
300	4140.20	Br II	280	4148.86	Gd I	350	4158.53	Tb I	450	4169.1	Se III
220	4140.235	Th II	280	4148.90	Ce II	110	4158.535	Th I	240	4169.32	Tb I
530 h	4140.30	Sc I	230	4148.94	Mo I	400	4158.590	Ar I	85	4169.35	Ti I
10	4140.34	Hg III	290	4148.97	Ho I	120	4158.60	Tm I	500	4169.42	Ce III
250	4140.46	Pm II	470	4149.07	Yb I	350	4158.61	Cs II	230	4169.45	Pr II
9	4140.48	Fe III	120	4149.14	Tm I	24	4158.98	Lu I	810	4169.48	Sm II
15	4140.54	Sb II	7	4149.19	K II	450	4159.03	Ce II	1000	4169.68	Tc I
100 s	4140.96	Am I	1200	4149.20	Zr II	10000	4159.39	Pu II	320	4169.77	Ce II
30	4141.02	Eu II	420	4149.79	Ce II	85	4159.64	Ti I	100	4169.77	Te II
80	4141.06	Mn I	810	4149.83	Sm II	150	4159.69	V I	40	4169.84	Cr I
10000	4141.20	Pu II	650	4149.92	Al III	100	4160.26	La I	90	4169.84	Pd I
1500 c	4141.22	Pr II	980	4149.94	Ce II	340	4160.57	Nd II	320	4169.88	Ce II
460	4141.22	U II	140	4149.96	Re I	3 d	4160.67	Co II	35	4170.20	Cr I
400	4141.27	Tc I	450	4149.986	Th II	500	4161.140	Cu II	4000	4170.27	Tc I
50	4141.49	Cd II	10	4150.04	Yb III	400	4161.21	Zr II	160	4170.40	Re I
470	4141.50	Dy II	870	4150.12	Nb I	85	4161.42	Cr I	1200	4170.52	Po I
60	4141.72	Eu II	650	4150.17	Al III	200	4161.80	Sr II	160	4170.53	W I
550	4141.74	La II	420	4150.91	Ce II	90hd	4161.88	Sc I	10000	4170.95	Pu I
230	4142.19	Ho I	170	4150.96	Ti I	150	4162.36	Hf II	120	4171.03	Ti I
110	4142.25	W I	10000	4151.09	Pu I	110	4162.69	Hf I	240	4171.05	Tb I
280	4142.3	S II	6900	4151.11	Er I	450	4162.7	S II	450	4171.17	W I
110 h	4142.37	Al III	350	4151.27	Cs II	100	4162.72	Yb III	65 h	4171.56	Sc I
770	4142.40	Ce II	10000	4151.45	Pu I	540	4162.73	Gd II	410	4171.57	Sm II
90	4142.46	Pr III	30	4151.52	Eu II	150	4162.86	C III	1400	4171.59	U II
250	4142.701	Th II	45	4151.64	Eu II	8100	4163.03	Ho I	620	4171.82	Pr II
7500	4142.85	Y I	1400	4151.97	Ce II	280	4163.09	Gd II	400	4171.851	Cu II
550	4142.91	Er II	1100	4151.97	La II	870	4163.47	Nb I	40	4171.90	Ti II
200	4143.017	Cu II	1200	4152.21	Sm II	310	4163.52	Ce II	370	4171.93	Dy I
85	4143.05	Ti I	720	4152.36	Sc I	30	4163.55	Te II	10	4172.04	Ga I
1200	4143.10	Dy II	4400	4152.58	Nb I	140	4163.62	Cr I	90	4172.15	Pr III
2700	4143.11	Pr II	980cw	4152.61	Ho II	70	4163.65	Ti II	160	4172.23	Ho I
350	4143.21	Nb I	200	4152.64	Zr I	4400	4163.66	Nb I	730	4172.25	Pr II
200	4143.415	Fe I	30	4152.78	Cr I	350	4163.68	U II	5000	4172.53	Tc I
280	4143.51	Tb I	220	4152.78	La II	35	4164.14	Ti I	90	4172.56	Ir I
2900	4143.55	Mo I	10	4152.82	Pb II	1700 c	4164.16	Pr II	180	4172.57	Os I
3	4143.76	He I	450	4153.1	S II	50	4164.180	Ar I	240	4172.60	Tb I
800	4143.869	Fe I	15	4153.11	Yb III	370	4164.284	Cu II	50	4172.744	Fe I
2000	4144.16	Ru I	230	4153.13	Ce II	15	4164.31	Ca III	40	4172.77	Cr I
700	4144.36	Re I	220	4153.30	O II	80	4164.56	Pt I	110	4172.80	Eu II
1100	4144.41	Tb II	530	4153.33	Sm II	4000	4164.66	Nb I	240	4172.82	Tb I
120	4144.48	Pr III	15	4153.57	Ca III	18	4164.73	Fe III	60	4172.95	Yb III
390	4144.49	Ce II	300	4153.623	Cu II	9	4164.92	Fe III	2500	4173.23	Ho I
6000	4144.95	Tc I	120	4153.82	Cr I	4	4165.10	Mg I	1200	4173.23	Os I
670	4145.00	Ce II	40	4153.898	Fe I	1100 h	4165.19	Sc I	260	4173.47	Tb I
3000	4145.08	Tc I	880	4153.97	U I	70	4165.52	Cr I	100	4174.01	V I
360	4145.1	S II	460	4154.08	Lu I	1300	4165.61	Ce II	2000	4174.14	Y I
250	4145.122	Kr II	240	4154.37	Rh I	10000	4165.61	Tc I	13	4174.26	Fe III
3	4145.13	Co II	40	4154.46	Kr III	140	4165.766	Th I	1100	4174.34	Hf I
140	4145.16	W I	50	4154.500	Fe I	200	4166.00	Ba II	120	4174.56	Yb I
100	4145.7	Xe III	160	4154.66	W I	15	4166.04	Ir I	170	4174.80	Cr I
650	4145.74	Ru I	55 h	4154.72	Sc	40	4166.32	Ti I	60	4174.912	Fe I
140	4145.76	Hf I	9	4154.96	Fe III	400	4166.36	Zr I	30	4175.16	Eu II
110	4145.95	W I	560	4155.22	Sm II	13	4166.84	Fe III	210	4175.21	Ta I
990	4146.06	Dy I	250	4155.28	Mo I	620	4166.88	Ce II	360	4175.3	Se II
50	4146.06	O II	10000	4155.46	Pu I	280	4167.16	Gd II	250	4175.32	Pr II
480	4146.23	Ce II	27	4155.70	Ir I		4167.27	Gd I	2400	4175.54	Gd I
270 c	4146.50	Pr II	4	4155.75	Tl III	15	4167.27	Mg I	810	4175.61	Nd II
5	4146.70	Ar III	3000	4156.08	Nd II	500	4167.42	Tc I	250	4175.62	Pr II
260	4146.77	Ru I	35	4156.086	Ar II	870	4167.51	Ru I	620	4175.63	Os I
10000 l	4147.13	Bk II	290	4156.24	Zr II	2400	4167.52	Y I	50	4175.635	Fe I
65 h	4147.40	Sc I	510	4156.26	Nd II	10000	4167.77	Pu I	30	4175.94	Cr I
55	4147.53	Mn I	200	4156.50	Pr II	250	4167.80	Ce II	285	4176.16	N II
200	4147.62	Tc I	380	4156.65	U I	5700	4167.97	Dy I	3000 l	4176.18	Pa II
320	4147.71	Sm II	60	4156.799	Fe I	410	4168.00	Nd II	1000	4176.28	Tc I
90	4147.85	Pr III	200	4157.40	Mo I	10000	4168.033	Pb I	150	4176.60	Mn I
230	4147.89	Ta I	100 h	4157.63	Y I	270	4168.04	Pr II	340	4176.70	Ce II
200	4148.182	Th II	30	4157.72	Eu I	3500	4168.13	Nb I	600	4177.26	Gd III
270	4148.44	Pr II	10	4157.814	Pb I	3000 s	4168.40	Ac II	2400	4177.32	Nd II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
8000	4177.54	Y II	120	4187.038	Fe I	15	4195.17	Sb II	60000cw	4205.05	Eu II
50	4177.593	Fe I	300	4187.16	Tb I	320	4195.19	Dy II	230	4205.06	Dy I
100	4177.92	Ta I	530	4187.32	Ce II	40	4195.329	Fe I	140 c	4205.14	In II
440	4178.02	Sm II	280	4187.32	La I	40	4195.36	Eu II	75	4205.20	Sc I
620	4178.060	Th II	660	4187.56	Zr I	1300	4195.66	Nb I	870	4205.31	Nb I
200	4178.27	Mo I	65 h	4187.62	Sc I	120	4195.76	N III	130	4205.32	Er I
10000	4178.28	Pu II	8800	4187.62	Tm I		4196.	Li I	470	4205.60	Nd II
100	4178.48	P II	120	4187.795	Fe I	40	4196.18	Eu II	300	4205.88	Ta I
200	4178.63	Pr II	1000 s	4188.12	Am II	10000	4196.20	Pu II	220	4206.00	Tm II
200	4178.64	Nd II	1000	4188.13	Sm II	630	4196.34	Ce II	1500	4206.02	Ru I
200	4178.96	Ge III	2500	4188.32	Mo I	330	4196.50	Rh I	660	4206.13	Sm II
170	4179.26	Cr I	40	4188.69	Ti I	1500	4196.55	La II	40	4206.18	Ca II
30	4179.29	Te II	300	4189.27	U II	390	4196.74	Tb I	120	4206.40	Ta I
35	4179.297	Ar II	2500	4189.48	Pr II	240	4197.01	Pr III	10000	4206.48	Pu I
5200	4179.39	Pr II	10000 s	4189.69	Bk II	40	4197.23	Cr I	600	4206.49	Tb I
230	4179.42	V I	450	4189.79	O II	615	4197.40	As II	370	4206.54	Dy II
500	4179.512	Cu II	180	4189.84	V I	10000 s	4197.44	Bk II	160	4206.58	Hf II
640	4179.59	Nd II	10000	4189.90	Pu II	23	4197.54	Ir I	70	4206.62	Rh I
400	4179.63	Br II	320	4189.91	Os I	550	4197.58	Ru I	270	4206.62	Sm II
250	4179.714	Th II	280	4189.98	Er II	450	4197.68	Gd II	80	4206.696	Fe I
150	4179.77	Pr III	120	4189.99	Mn I	280	4198.00	Ce II	2500 c	4206.72	Pr II
100	4179.98	Ac I	10000	4190.06	Pu II	800	4198.02	Dy I	220	4207.05	W I
1000 h	4180.10	Xe II	715	4190.082	As II	100	4198.08	Ho I	140	4207.15	F II
340	4180.81	Yb II	35	4190.13	Cr I	50	4198.13	Si II	18	4207.24	Ca III
450	4180.9	Se II	1000	4190.70	Er I	150	4198.304	Fe I	10000	4207.66	Cm II
340	4181.08	Ce II	90	4190.71	Co I	200	4198.317	Ar I	10000	4208.23	Pu I
530	4181.10	Sm II	100	4190.713	Ar I	310	4198.51	Nb I	500	4208.32	Pr II
1	4181.13	Co II	100 h	4190.72	Si II	85	4198.52	Cr I	35	4208.36	Cr I
130	4181.15	Ta I	2200	4190.78	Gd I	280	4198.67	Ce II	300 h	4208.48	Xe II
120	4181.754	Fe I	1200	4190.88	Nb I	840	4198.72	Ce II	1	4208.61	Co II
50	4181.884	Ar I	320	4190.94	Dy I	10	4198.74	Yb III	620	4208.890	Th II
110	4182.22	Eu I	120	4190.95	Hf I	550	4198.88	Ru I	610	4208.98	Zr II
35	4182.47	Ir I	50	4191.029	Ar I	610	4199.09	Zr I	110	4209.37	Cr I
150	4182.59	V I	750	4191.07	Gd II	40	4199.095	Fe I	270	4209.41	Ce II
220	4182.90	Re I	85	4191.27	Cr I	120	4199.28	Y II	100 h	4209.47	Xe II
220	4183.06	Re I	80	4191.430	Fe I	270	4199.45	Sm II	65	4209.67	Cl I
20	4183.12	Ac I	180	4191.56	V I	7600	4199.90	Ru I	300 s	4209.69	Ac II
15 h	4183.21	Ir I	560 c	4191.60	Pr II	520	4199.92	Tm II	190	4209.70	Hf I
35	4183.30	Ti I	750	4191.63	Gd I	150	4200.10	N III	40	4209.76	Cr I
200	4183.32	Zr I	2200	4191.64	Dy I	20	4200.32	V V	230	4209.86	V I
210	4183.33	Sm I	300	4191.70	Ce III	400	4200.674	Ar I	80	4210.343	Fe I
10 h	4183.35	Si II	410	4191.93	Sm II	70	4200.75	Ti I	660	4210.35	Sm II
930	4183.72	Dy I	870	4192.07	Nb I	450	4201.00	Tb II	9	4210.67	Fe III
530	4183.76	Sm II	35	4192.10	Cr I	30	4201.13	Au I	130	4210.923	Th I
120	4184.13	Os I	280	4192.36	La II	290	4201.17	Pr II	90 h	4210.96	Ag I
30	4184.138	Th I	40	4192.43	Pt I	240	4201.24	Ce II	3300	4211.14	Rh I
180	4184.18	Pr III	300	4192.92	Pm II	680	4201.30	Dy I	440	4211.24	Dy I
15	4184.20	Ca III	130	4193.017	Th I	180	4201.45	Os I	470	4211.29	Nd II
2400	4184.25	Gd II	3500	4193.08	Rb II	610	4201.46	Zr I	100	4211.30	Ho II
1600	4184.25	Lu II	560	4193.09	Ce II	350	4201.52	Nb I	25	4211.31	Te II
310	4184.44	Nb I	500 h	4193.15	Xe II	65	4201.76	Mn I	40	4211.35	Cr I
50	4184.891	Fe I	60	4193.20	Cs II	1000	4201.80	Rb I	10000	4211.62	Cm I
35	4184.90	Cr I	370	4193.28	Ce II	300	4202.029	Fe I	16000	4211.72	Dy I
250	4184.98	Nd II	300	4193.45	Br II	250	4202.06	Os I	35	4211.73	Ti I
340	4185.33	Ce II	85	4193.66	Cr I	680	4202.24	Dy I	65	4211.75	Mn I
285	4185.46	O II	370	4193.87	Ce II	650	4202.92	Sm II	1200	4211.86	Os I
100	4185.48	Ag II	8	4194.09	Ra II	910	4202.94	Ce II	320	4211.86	Pr II
18	4185.66	Ir I	30	4194.34	Yb III	1100	4203.05	Sm II	500	4211.866	Cu II
200	4185.74	Pm II	540	4194.35	Ho I	130	4203.21	Ho I	200	4211.88	Zr II
480	4185.82	Mo I	20	4194.40	Ac I	85	4203.46	Ti I	1300	4212.00	Gd II
360	4186.12	Ti I	250	4194.56	Mo I	60	4203.59	Cr I	5400	4212.06	Ru I
240	4186.21	Tb I	200	4194.70	Pm II	6000	4203.73	Tm I	65	4212.34	Sc I
8	4186.24	K II	400	4194.76	Zr I	650	4203.74	Tb I	7 h	4212.41	Si IV
30	4186.36	Cr I	110	4194.79	B II	40	4203.984	Fe I	45	4212.49	Sc I
45 h	4186.45	Sc I	500	4194.83	Ce III	240	4204.04	La II	100	4212.82	Ag I
800	4186.51	Tc I	6800	4194.84	Dy I	160	4204.40	W I	2500	4212.95	Pd I
3500	4186.60	Ce II	70	4194.95	Cr I	40	4204.47	Cr I	80	4213.02	Y I
12000	4186.82	Dy I	100	4194.95	Yb III	380	4204.70	Y II	100 d	4213.04	In II
250 h	4186.90	C III	870	4195.09	Nb I	590	4204.86	Gd II	500	4213.13	Cs II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
1800	4213.18	Dy I	40	4221.88	Sc I	15	4231.07	Yb III	680	4239.85	Dy I
300	4213.26	Ce III	110	4222.04	W I	130 h	4231.24	Ho I	980	4239.92	Ce II
300cw	4213.50	Tb I	200	4222.15	Pm II	180	4231.45	Pr III	270	4240.02	Pr II
40	4213.54	Y I	500	4222.195	P III	390	4231.74	Ce II	770	4240.34	Zr I
300	4213.64	Yb III	540	4222.21	Dy I	260	4231.89	Tb I	200	4240.37	Na II
300 h	4213.72	Xe II	50	4222.212	Fe I	180	4231.93	Sc I	15	4240.46	Ca I
120	4213.86	Os I	11	4222.27	Fe III	120	4231.97	Yb I	60	4240.70	Cr I
400	4213.86	Zr I	290	4222.29	Ho I	680	4232.02	Dy I	16	4240.74	Ca III
370	4214.04	Ce II	350	4222.37	U I	500	4232.19	Cs II	250	4240.90	Na II
300	4214.42	Tb II	1500	4222.60	Ce II	1300	4232.38	Nd II	960	4241.01	Pr II
760	4214.44	Ru I	25	4222.637	Ar II	170	4232.44	Hf II	760	4241.05	Ru I
350	4214.73	Nb I	380	4222.67	Tm I	75	4232.45	Eu II	20	4241.094	Th I
28	4214.828	Th I	40	4222.73	Cr I	360	4232.46	V I	770	4241.20	Zr I
970	4215.02	Gd II	3800	4222.93	Pr II	1500	4232.59	Mo I	150	4241.39	Re I
480	4215.09	Tb I	7	4222.97	K II	480	4232.82	Tb I	290	4241.44	W I
3700	4215.16	Dy I	300 h	4223.00	Xe II	180	4232.95	V I	1000	4241.67	U II
100	4215.16	Os I	8	4223.05	Tl II	320	4233.11	Pr II	1200	4241.69	Zr I
110	4215.38	W I	290	4223.47	Ho I	11	4233.17	Fe II	450	4241.78	N II
32000	4215.52	Sr II	40	4223.88	Eu II	250	4233.26	Na II	100	4241.80	Au I
11	4215.52	Ti III	1000	4223.89	Br II	80	4233.27	O I	100	4241.97	Cs II
500	4215.53	Rb I	10000	4224.20	Pu I	170	4233.46	Os I	3	4242.08	Na I
100	4215.60	Xe II	80	4224.25	Y I	100	4233.602	Fe I	9 c	4242.14	Pb II
500	4216.04	Ba II	260	4224.28	Tb I	200	4233.61	Sc I	3000	4242.15	Tm II
75 h	4216.10	Sc I	12	4224.6	Bi III	17	4233.74	Ca III	10000	4242.38	Cf I
400	4216.183	Fe I	40	4224.79	Ti I	100	4233.85	Ne II	390	4242.72	Ce II
40	4216.36	Cr I	320	4225.03	Gd I	180	4234.00	V I	40	4242.98	B III
100	4216.74	Hg III	2700	4225.16	Dy I	250	4234.19	Nd II	615	4242.982	As II
300	4217.13	Ce III	170 h	4225.16	F II	240	4234.21	Ce II	760	4243.06	Ru I
650	4217.20	Gd II	1000	4225.33	Sm II	150	4234.34	W I	340	4243.51	Pr II
10000 l	4217.23	Pa II	3800	4225.35	Pr II	350	4234.41	Cs II	70	4243.61	B III
930	4217.27	Ru I	90 d	4225.59	Sc I	620	4234.57	Sm II	12	4243.75	Fe III
300	4217.56	La II	7	4225.67	K II	140	4234.78	Er II	290	4243.78	Ho I
300	4217.56	Tb I	80	4225.73	Te II	370	4235.14	Mn I	150 h	4244.12	F II
310	4217.59	Ce II	4800	4225.85	Gd I	290 h	4235.24	Nd II	30 s	4244.25	Co II
85	4217.63	Cr I	50	4225.956	Fe I	510	4235.29	Mn I	540	4244.36	W I
27	4217.76	Ir I	10	4226.06	Rn I	300	4235.35	Tb I	520	4244.37	U II
160	4217.80	Y I	50	4226.42	Cl I	85	4235.463	Th I	90000	4244.40	Rb II
320	4217.81	Pr II	480cw	4226.45	Tb II	13	4235.56	Fe III	40	4244.44	Rh I
420	4217.94	Nb I	70	4226.562	Ge I	600	4235.73	Y II	620	4244.70	Sm II
4400	4218.09	Dy I	120	4226.62	V I	120	4235.76	V I	8	4244.72	Ra II
110 h	4218.26	Sc I	50	4226.73	Ca I	250	4235.936	Fe I	45	4244.74	Eu I
1400	4218.43	Er I	290	4226.81	Al II	2200	4235.94	Y I	20 c	4244.92	Pb II
150 d	4218.56	Yb II	25	4226.988	Ar II	200	4236.02	Ce II	130	4245.35	Ta I
300	4218.61	Tc I	2000	4227.04	Ho I	200	4236.06	Zr I	500 h	4245.38	Xe II
25	4218.665	Ar II	220	4227.14	Gd II	250	4236.13	Po	12	4245.41	Ge III
	4218.69	Yb I	55	4227.387	Th I	320 c	4236.15	Pr II	310	4245.89	Ce II
20	4219.07	Sb II	90 h	4227.40	Eu II	1200	4236.74	Sm II	440	4245.91	Dy I
260	4219.16	Tb I	200	4227.423	Fe I	300	4236.89	Br II	310	4245.98	Ce II
100	4219.360	Fe I	3600 c	4227.46	Re I	285	4236.91	N II	100	4246.12	Sc I
250	4219.37	W I	40	4227.65	Ti I	220	4237.05	N II	100	4246.17	Mn III
120	4219.45	Pr III	440	4227.73	Nd II	100	4237.220	Ar II	200	4246.23	F II
110 d	4219.66	In II	285	4227.74	N II	90	4237.51	Eu II	190	4246.39	F II
110 h	4219.73	Sc I	770	4227.75	Ce II	500	4237.66	Sm II	30	4246.47	Te II
150	4219.74	Ne II	2000	4227.76	Zr I	100	4237.82	Sc I	200	4246.57	Gd II
55	4220.065	Th I	30 h	4227.88	Au I	130	4237.89	Ti I	180	4246.59	F II
50	4220.07	Ca II	170	4228.08	Hf I	400	4238.05	Sc I	390	4246.72	Ce II
290	4220.25	Nd II	100	4228.158	Ar II	10000 c	4238.19	Tc I	350	4246.720	P III
280 h	4220.63	Y I	420	4229.15	Nb I	400 h	4238.25	Xe II	370	4246.73	Ru I
740	4220.66	Sm II	75	4229.33	Eu II	1600	4238.38	La II	170	4246.77	F II
370	4220.68	Ru I	390	4229.52	Ho II	9	4238.62	Fe III	15000	4246.83	Sc II
13	4220.80	Ir I	740	4229.70	Sm II	45	4238.69	Eu II	160	4246.84	F II
10	4220.83	Yb III	10000	4229.77	Pu II	650	4238.78	Gd II	45	4247.06	Eu II
200	4220.99	Er I	220	4229.80	Gd II	50	4238.809	Fe I	2000	4247.38	Nd II
45	4221.08	Eu II	320	4230.20	Er II	40	4238.96	Cr I	50	4247.425	Fe I
650	4221.08	Re I	29	4230.20	Rh I	2	4238.99	Na I	840 c	4247.63	Pr II
4400	4221.11	Dy I	550	4230.31	Ru I	2000	4239.31	Zr I	30	4247.989	Th II
200	4221.12	Cs II	320	4230.449	Cu II	90	4239.57	Sc I	10000 s	4248.08	Pa II
40	4221.57	Cr I	30	4230.824	Th I	190	4239.72	Mn I	1100	4248.68	Ce II
10000	4221.87	Pu I	200	4230.95	La II	290	4239.84	Nd II	85	4249.12	Ti I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
90 h	4249.14	Be III	170	4260.98	Hf I	2000 p	4270.76	La IV	470 c	4280.07	Pr II
210	4249.55	Sm II	100	4261.11	Te II	30	4271.06	Cr I	300	4280.27	La I
300	4249.656	P IV	60	4261.35	Cr I	250	4271.153	Fe I	85	4280.40	Cr I
140	4249.99	La II	70	4261.60	Ti I	460	4271.55	V I	910	4280.49	Gd II
200	4250.118	Fe I	410	4261.84	Nd II	270	4271.71	Tm I	2200	4280.79	Sm II
150	4250.580	Kr II	10000	4261.88	Pu I	100	4271.74	Cs II	250	4281.03	Lu I
120	4250.65	Ne II	40	4262.00	Ga II	1200	4271.759	Fe I	270	4281.10	Mn I
300	4250.787	Fe I	770	4262.05	Nb I	300	4271.91	Lu III	10000	4281.17	Pu I
4	4251.11	Ga II	1600	4262.09	Gd I	25	4272.0	Bi II	110	4281.38	Ti I
20	4251.15	Te II	120	4262.16	V I	150	4272.169	Ar I	700	4282.042	Th II
15	4251.16	Ga II	20000	4262.27	Tc I	790 c	4272.27	Pr II	550	4282.20	Zr I
25	4251.185	Ar I	1300	4262.68	Sm II	8	4272.33	Co II	710	4282.21	Sm I
300	4251.20	Y I	1000	4262.69	Tc I	85	4272.43	Ti I	110	4282.34	W I
200	4251.44	Lu III	330	4263.13	Ti I	8	4272.66	Pb III	1200	4282.402	Fe I
100 l	4251.57	Xe II	110	4263.14	Cr I	340	4272.79	Nd II	790 c	4282.42	Pr II
1700	4251.73	Gd II	200	4263.30	W I	170	4272.85	Hf II	470	4282.44	Nd II
250	4251.78	Sm II	200	4263.39	Hf I	40	4272.91	Cr I	240	4282.57	Nd II
200	4251.94	Er II	7	4263.40	K II	20	4273.07	Li I	220	4282.71	Ti I
120bl	4252.08	HfO	200	4263.43	Ce II	20	4273.13	Li I	470	4282.83	Sm I
850	4252.44	Nd II	320	4263.59	La II	15000	4273.14	Rb II	20	4282.898	Ar II
100	4252.68	In III	260	4263.66	Tb I	10000	4273.34	Pu II	100	4282.967	Kr I
100	4253.05	Be I	270 c	4263.78	Pr II	280	4273.357	Th II	24	4283.01	Ca I
390	4253.37	Ce II	490	4264.05	Ho I	12 h	4273.40	Fe III	100	4283.10	Ba I
860	4253.37	Gd II	300 r	4264.32	Pm I	60	4273.43	Rh I	200	4283.40	Cu III
110	4253.538	Th I	30	4264.36	Te II	60	4273.43	Te II	240	4283.50	Sm I
360	4253.6	S III	60	4264.58	Cl I	100	4273.63	Ho II	55	4283.56	Sc
650	4253.61	Gd II	100	4264.75	Os I	4	4273.64	Na I	430	4284.06	V I
50 d	4253.74	O II	500	4265.08	Sm II	1000	4273.969	Kr I	65	4284.08	Mn I
60	4253.76	Be I	40	4265.09	Sb III	300	4274.17	Gd I	760	4284.33	Ru I
45	4253.80	Eu II	27	4265.30	Ir I	220	4274.55	W I	300 r	4284.37	Pm I
50 d	4253.98	O II	1000	4265.55	Am I	240	4274.58	Ti I	15	4284.39	Ca III
10 h	4254.04	Ga II	35	4265.71	Ti I	16000	4274.80	Cr I	710	4284.52	Nd II
290	4254.29	Nd	290	4265.92	Mn I	800	4274.97	Tc II	400	4284.77	Ce III
20000	4254.35	Cr I	420	4266.02	Nb I	20	4274.98	Tl II	160	4284.99	Ti I
500	4254.40	Pr II	300	4266.04	Ho I	180	4275.07	Pr III	110	4285.0	S III
1300cw	4254.43	Ho I	40	4266.22	Ti I	340	4275.09	Nd II	100	4285.08	Cd II
10000	4254.76	Pu II	100	4266.286	Ar I	950	4275.11	Cu I	300	4285.13	Tb II
370	4255.24	Tb I	650	4266.34	Tb I	220	4275.21	Tb I	280	4285.37	Ce II
250	4255.44	Nb I	10000	4266.45	Cm I	170 h	4275.36	F II	430	4285.82	Gd I
70	4255.50	Cr I	70	4266.527	Ar II	50 d	4275.47	O II	80	4285.85	Te II
200	4255.635	Cu II	500	4266.58	Rb II	160	4275.49	W I	30	4285.9	Xe III
4 h	4255.64	Ga II	650	4266.60	Gd I	240	4275.64	La II	100	4285.90	Os I
5	4255.70	Ga II	340	4266.71	Nd II	120	4276.43	Ti I	890	4286.01	Ti I
10	4255.77	Ga II	800	4267.00	C II	140	4276.48	Er II	110	4286.01	W I
620	4255.79	Ce II	470	4267.00	Gd I	250	4276.69	Dy I	300	4286.12	Gd I
130	4256.04	Ti I	1000	4267.26	C II	160	4276.74	W I	14 h	4286.16	Fe III
70	4256.254	Th I	800	4267.95	Ba II	5	4276.79	Na I	120	4286.32	Pr III
440	4256.33	Dy II	310	4268.02	Zr I	890	4276.91	Mo I	690	4286.56	Er I
2100	4256.39	Sm II	260	4268.10	Ir I	460	4276.96	V I	23	4286.62	Ir I
100	4257.37	V I	130	4268.26	Ta I	2000	4277.10	Cs II	350	4286.64	Sm II
260 c	4257.60	Re I	560	4268.64	V I	1200	4277.24	Mo I	600	4286.97	La II
290	4257.66	Mn I	320	4269.09	Pr II	480	4277.313	Th II	400	4286.99	Nb I
480	4258.23	Tb II	270	4269.28	Mo I	150	4277.50	Lu I	840	4287.40	Ti I
40	4258.315	Fe I	1400	4269.38	W I	550	4277.528	Ar II	300	4287.80	Ba II
70	4258.54	Ti I	480	4269.50	La II	160 h	4277.53	F II	2	4287.84	Na I
210	4258.58	Sm II	120	4269.61	Os I	70	4277.74	Yb I	2500 c	4287.97	Rb II
130 c	4258.61	Ho II	330	4269.69	Tb I	120	4278.23	Ti I	30	4288.16	Ti I
310	4258.99	Ru I	10000	4269.77	Pu I	760cw	4278.52	Tb II	1000	4288.18	Er III
75	4259.11	Ir I	110	4269.77	W I	60	4278.60	Rh I	20 h	4288.25	Co II
120	4259.31	V I	6	4269.81	Tl III	30	4278.81	Ti I	1000	4288.35	Cs II
290	4259.35	W I	11	4269.84	Ti III	200	4278.86	Ce II	200	4288.60	P II
200	4259.362	Ar I	28	4269.942	Th I	800	4278.90	Tc I	1400	4288.64	Mo I
75 h	4259.4	Bi II	70	4270.14	Ti I	160 h	4278.93	F II	200	4288.66	Ce II
810	4260.12	Gd I	620	4270.19	Ce II	1200	4279.68	Sm II	28	4288.669	Th I
200	4260.29	W I	30	4270.24	Eu II	12	4279.72	Fe III	820	4288.71	Rh I
110	4260.333	Th I	250 c	4270.25	Rb II		4279.75	Sm II	950	4289.07	Ti I
800	4260.473	Fe I	240	4270.56	Nd II	240	4279.94	Sm II	10000	4289.08	Pu II
200	4260.85	Ge III	290	4270.69	Nb I	400	4279.96	Gd III	5000	4289.26	Am I
4900	4260.85	Os I	390	4270.72	Ce II	300	4279.962	Cu II	22	4289.36	Ca I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
200	4289.44	Ce II	90	4298.27	Pr III	40	4306.80	Tl II	360	4318.64	Ti I
20	4289.64	Yb III	25	4298.33	Zn I	160	4306.87	W I	22	4318.65	Ca I
300	4289.70	Tb I	370	4298.36	Tb I	100	4307.176	Th I	400	4318.80	Pm I
10000	4289.72	Cr I	150	4298.36	Tm I	240	4307.18	Tb I	2200	4318.83	Tb I
2000	4289.94	Ce II	9	4298.57	Sr IV	140	4307.18	V I	1900	4318.94	Sm II
40000	4290.06	Er III	2000	4298.66	Ti I	930	4307.60	Ru I	470	4319.53	Sm I
120	4290.23	Ti II	150	4298.73	Eu I	110	4307.64	W I	1000	4319.579	Kr I
840	4290.94	Ti I	320	4298.91	Er I	23	4307.74	Ca I	35	4319.64	Cr I
3	4291.01	Na I	450 c	4298.98	Pr II	80	4307.76	Rn I	550	4319.87	Ru I
120	4291.14	Ti I	22	4298.99	Ca I	200	4307.78	Nd II	110	4319.94	Er II
120 c	4291.17	Re I	200	4299.17	F II	180	4307.90	Ti II	370	4320.52	Gd I
3000 s	4291.34	Pa II	200	4299.23	Ti I	1200	4307.901	Fe I	560	4320.72	Ce II
300	4291.39	Br II	250	4299.234	Fe I	50	4307.94	Cs II	3300	4320.74	Sc II
80	4291.462	Fe I	430	4299.29	Gd I	35	4308.50	Ti I	40	4320.90	Te II
150	4291.71	Ge III	590	4299.36	Ce II	1000	4308.63	Dy II	250	4320.91	Na II
330	4291.82	V I	580	4299.60	Nb I	250	4308.81	Na II	750	4321.11	Gd II
40	4291.96	Cr I	200	4299.64	Ti I	880	4309.01	Sm II		4321.20	Gd I
200	4292.00	Cs II	85	4299.839	Th I	250	4309.04	Na II	6	4321.40	Na I
680	4292.13	Mo I	300	4299.90	Tb I	7	4309.10	K II	180	4321.66	Ti I
350	4292.18	Sm II	200	4300.05	Ti II	70	4309.239	Ar II	500 d	4321.84	I I
500	4292.470	Cu II	100	4300.101	Ar I	260	4309.29	Gd I	600	4322.23	Tb I
250	4292.48	Na II	770	4300.33	Ce II	800	4309.32	Ba II	440	4322.51	La II
250	4292.86	Na II	120	4300.44	La II	40	4309.47	Sc III	150 h	4322.98	Kr II
25	4292.88	Zn I	200	4300.49	Kr II	120	4309.56	Nb I	20 h	4323.00	Ba I
600	4292.923	Kr II	35	4300.51	Cr I	150	4309.57	Lu I	590	4323.28	Sm II
10000	4293.00	Cm I	2900	4300.56	Ti I	2800	4309.63	Y II	210	4323.55	Pr II
890	4293.21	Mo I	500	4300.64	Cs II	200 s	4309.65	Am II	50	4323.63	Mn II
220	4293.28	Ru I	25	4300.650	Ar II	390	4309.74	Ce II	9	4323.68	Fe III
7	4293.82	Pb II	580	4300.99	Nb I	170	4309.80	V I	500	4323.867	As II
360	4293.88	Mo I	4100	4301.09	Ti I	200	4309.991	Th II	240	4324.46	Sm I
560	4293.95	Os I	40	4301.14	Yb III	20 h	4310.36	Fe III	2000 s	4324.57	Am II
1500	4293.97	Rb II	50	4301.18	Cr I	450	4310.42	Tb I	7	4324.62	Na I
110	4294.10	W I	320	4301.60	Er II	500 h	4310.51	Xe II	2400	4325.01	Sc II
140	4294.12	Ti II	75	4301.60	Ir I	55	4310.59	Ir I	60	4325.08	Cr I
4100	4294.61	W I	70 h	4301.7	Bi II	200	4311.04	Ho I	190	4325.13	Ti I
1	4294.65	Sn II	90	4301.73	Pr III	50	4311.07	Ag I	30	4325.274	Th I
290	4294.77	Sc II	85	4301.93	Ti II	390	4311.27	Nb I	5	4325.42	Li II
320	4294.79	Hf I	2200	4302.11	W I	560	4311.40	Os I	5	4325.47	Li II
260	4294.79	Ru I	360 h	4302.30	Y I	220	4311.50	Ir I	1	4325.54	Li II
550	4294.79	Zr I	25	4302.53	Ca I	300	4311.56	Tb I	200	4325.56	C III
370 d	4294.93	Dy II	20	4302.81	Ca III	40	4311.65	Ti I	2600 d	4325.57	Gd II
	4295.04	Dy I	310	4302.89	Zr I	120	4312.45	Nb I		4325.69	Gd I
85	4295.76	Cr I	240	4302.95	Tb I	65	4312.55	Mn I	600	4325.73	Ba II
840	4295.76	Ti I	160 c	4302.98	Ta I	240	4312.85	Sm I	1100	4325.76	Nd II
550	4295.93	Ru I	5400	4303.58	Nd II	85	4312.87	Ti II	1500	4325.761	Fe I
330 d	4295.97	Lu I	290	4303.61	Pr II	370	4313.25	Tb I	600	4325.83	Tb II
600	4296.05	La II	50 d	4303.78	O II	1800	4313.84	Gd I	320	4325.86	Dy I
200	4296.07	Ce II	140	4303.81	Er II	4200	4314.09	Sc II	250	4325.92	Pm II
540	4296.08	Gd II	200	4303.89	Pm II	3	4314.10	Si IV	840	4326.14	Mo I
	4296.09	Lu I	20	4304.01	Yb III	300	4314.28	Gd III	110	4326.25	Os I
220	4296.11	V I	200	4304.40	Re I	20	4314.32	Sb II	350	4326.33	Nb I
500 h	4296.40	Xe II	340	4304.45	Nd II	85	4314.35	Ti I	160	4326.36	Ti I
6	4296.65	Pb II	300	4304.71	Ce III	520	4314.40	Gd I	3000	4326.43	Tb I
1500	4296.67	Ce II	18 h	4304.78	Fe III	470	4314.52	Nd II	200	4326.74	Ba II
11	4296.70	Ti III	320	4304.94	Sm II	1200	4314.80	Ti I	250	4326.74	Mo I
1600	4296.74	Sm I	7	4305.00	K II	150	4315.084	Fe I	18	4327.06	Pt I
70	4296.77	Rh I	420	4305.14	Ce II	200	4315.11	Au I	1900	4327.12	Gd I
420	4296.78	Ce II	30	4305.45	Cr I	55	4315.254	Th I	120	4327.38	Nb I
16 h	4296.85	Fe III	340	4305.45	Sr II	500	4315.657	As II	50	4327.58	Cs II
30000	4297.06	Tc I	200 r	4305.64	Pm I	520	4316.05	Gd II	25	4327.8	Bi III
220	4297.17	Gd II	350	4305.71	Sc II	50	4316.30	Y I	510	4327.93	Nd II
55	4297.306	Th I	1500	4305.76	Pr II	90	4316.34	Pr III	5	4328.18	Si IV
200	4297.60	Ba II	6000	4305.92	Ti I	70	4316.95	Yb II	340	4328.68	Os I
170	4297.68	V I	120	4305.97	Yb I	285	4317.14	O II	120	4328.7	Se I
3700	4297.71	Ru I	170	4306.21	V I	500 h	4317.81	Kr II	130	4328.81	Er I
70	4297.74	Cr I	500 c	4306.26	Rb II	120	4318.14	Hf I	3	4328.86	Co II
600	4297.78	Pm II	1100	4306.34	Gd I	110	4318.416	Th I	240	4328.90	Tb I
270	4297.80	Nd II	8	4306.672	Cd I	370	4318.43	Ru I	1800	4329.02	Sm II
170	4298.03	V I	770	4306.72	Ce II	400	4318.551	Kr I	10000	4329.03	Cf I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
15	4329.19	Ca III	540	4338.70	Nd II	285	4349.43	O II	300	4359.13	Ac II
90	4329.36	Eu I	360	4338.70	Pr II	100	4349.60	Rn I	200	4359.26	Tc I
270	4329.41	Pr II	100	4338.75	Os I	350	4349.70	Ru I	85	4359.372	Th I
10000 l	4329.58	Bk I	250	4339.22	Hg I	700	4349.79	Ce II	570	4359.63	Cr I
370	4329.58	Gd I	250	4339.224	Hg I	80	4350.33	Ba I	290	4359.74	Zr II
300	4329.62	Ba II	340	4339.31	Ce II	230	4350.34	Mo I	410 c	4359.79	Pr II
75	4329.97	Eu I	1100	4339.45	Cr I	340	4350.40	Pr II	2	4359.9	Tl I
440	4330.02	Sm I	380	4339.72	Cr I	560	4350.46	Sm II	2700	4359.93	Tm I
460	4330.02	V I	12 h	4339.8	Bi II	150	4350.51	Hf II	280	4360.16	Tb I
350	4330.24	Cs II	5	4340.03	K II	1300	4350.73	Ho I	95	4360.49	Ti I
160	4330.27	Hf I	60	4340.13	Cr I	15	4350.80	Yb III	300	4360.66	Be II
100	4330.3	Se I	200	4340.413	Pb I	380	4351.05	Cr I	560	4360.72	Sm II
310	4330.45	Ce II	30	4340.47	H I	680	4351.29	Nd II	310	4360.81	Zr I
1000 l	4330.52	Xe II	25 h	4340.5	Bi II	18	4351.30	Ir I	500	4360.99	Be II
60	4330.61	Eu II	700	4340.62	Tb I	100	4351.359	Kr I	30	4361.04	Au II
340	4330.61	Gd II	100	4340.64	Ra II	10000	4351.50	Bk I	220	4361.07	Sm II
250	4330.64	Ho II	140	4340.92	Er I	100	4351.53	Os I	870	4361.21	Ru I
110	4330.78	Y I	760	4341.01	V I	290	4351.57	Nb I	30	4361.28	Te II
10000	4330.82	Cm I	550	4341.13	Zr I	2300	4351.77	Cr I	27	4361.57	Eu II
28	4330.844	Th I	450	4341.28	Gd II	20	4351.91	Mg I	100	4361.81	W I
40	4331.18	Eu I	8	4341.40	Si III	500	4351.97	Cu III	810	4362.04	Sm II
200	4331.200	Ar II	4	4341.49	Na I	560	4352.10	Sm II	430	4362.05	U I
110	4331.36	Er I	680	4341.69	U II	500	4352.145	As II	25	4362.066	Ar II
390	4331.37	Nb I	29	4341.98	Lu II	50	4352.16	Sb III	500	4362.641	Kr I
240	4331.38	Gd I	30	4342.	Bi IV	50	4352.205	Ar II	440	4362.91	Sm I
50	4332.030	Ar II	550	4342.07	Ru I	60	4352.33	Y I	70	4363.13	Cr I
200	4332.05	Pm II	300	4342.12	Pm II	18	4352.56	Ir I	100	4363.27	Cl I
600	4332.12	Tb I	910	4342.18	Gd II	60	4352.70	Y I	2000	4363.28	Cs II
110	4332.13	W I	85	4342.256	Th II	560	4352.71	Ce II	220	4363.45	Sm II
200	4332.25	Re I	23	4342.44	Rh I	10000	4352.71	Pu II	10000	4363.64	Bk I
70	4332.7	S III	430cw	4342.53	Tb I	80	4352.734	Fe I	350 r	4363.92	Pm I
310	4332.71	Ce II	140	4342.82	Nb I	10	4352.74	Pb II	140	4363.93	Ho II
75	4332.72	Lu I	250	4344.11	Na II	1000	4352.80	Cu III	150	4364.00	Te II
510	4332.82	V I	24	4344.29	Ti II	425	4352.864	As II	110 h	4364.64	Al III
90	4332.91	N III	1000	4344.30	Gd II	1000	4352.87	V I	910	4364.66	Ce II
100	4333.561	Ar I	620cw	4344.30	Pr II	430 d	4353.20	Tb II	110	4364.67	La II
16	4333.57	Ca III	130	4344.326	Th II	35	4354.06	Ti I	150	4364.78	W I
4600	4333.74	La II	1900	4344.51	Cr I	710	4354.13	Ru I	28	4364.92	Sc I
1300	4333.97	Pr II	60	4344.65	Y I	60	4354.28	Pr III	2000	4365.14	Br I
1300	4334.15	Sm II	5	4344.74	Na I	550	4354.40	La II	400	4365.370	Cu II
30	4334.84	Ti I	12	4344.83	Sb II	55	4354.484	Th I	1000	4365.60	Br II
10000	4335.22	Cf I	25	4345.168	Ar I	6	4354.53	Mg I	210	4365.67	Os I
50	4335.338	Ar I	220	4345.56	O II	180	4354.61	Sc II	85	4365.930	Th I
200	4335.47	Tm III	120	4345.68	N III	450	4354.91	Pr II	100 d	4365.95	W I
200	4335.74	Pr II	10000	4345.69	Cm I	130	4354.98	V I	120	4366.03	Y I
7	4335.78	Rn I	560	4345.86	Sm II	20	4355.08	Ca I		4366.07	W I
35	4335.80	Sr III	70	4346.11	Ti I	240	4355.09	Eu II	240	4366.38	Nd II
880	4336.14	Sm I	600	4346.35	Ce III	110	4355.14	Ta I	350	4366.45	Zr I
240	4336.23	Ce II	2200	4346.46	Gd I	150	4355.17	W I	220	4366.90	O II
870	4336.43	Tb I	910	4346.62	Gd I	500	4355.24	Cu III	220	4367.30	Tb II
300	4336.54	Pm II	70	4346.83	Cr I	3000	4355.477	Kr II	10000	4367.41	Pu I
500	4336.64	As II	100cw	4346.84	Ho II	430 h	4355.74	U I	190	4367.58	Re I
180	4336.66	Hf II	1000	4346.96	Rb II	150	4355.94	V I	50	4367.832	Ar II
160	4336.86	O II	100	4347.00	W I	280	4356.09	Tb I	110	4367.90	Hf II
400 c	4336.86	Tc I	220	4347.31	Gd II	250	4356.33	Hf I	500	4368.03	Sm II
300	4337.13	Ho II	400	4347.49	Hg I	290	4356.73	Ho II	150	4368.04	V I
10000	4337.18	Pu II	470 c	4347.49	Pr II	870	4356.81	Tb I	100	4368.25	O I
130	4337.277	Th I	400	4347.496	Hg I	120	4357.73	Y I	1200	4368.33	Pr II
250	4337.29	Na II	200	4347.72	Pm I	40	4357.98	Re II	210	4368.43	Nb I
30	4337.29	Y I	1100	4347.80	Sm II	850	4358.17	Nd II	200	4368.60	Na II
200	4337.48	Pm II	1000	4347.89	Zr I	4000	4358.33	Hg I	340	4368.64	Nd II
780	4337.57	Cr I	10	4348.04	Ti III	4000	4358.337	Hg I	24	4368.94	Ti I
600	4337.64	Tb I	800	4348.064	Ar II	15	4358.38	Ca III	230	4369.04	Mo I
90	4337.68	Eu I	190	4348.34	Er I	200	4358.44	Dy II	200 h	4369.20	Xe II
980	4337.77	Ce II	28	4348.53	Sc I	400	4358.49	Tc I	110	4369.39	Er II
160	4337.92	Ti II	140	4348.65	Nb I	110	4358.64	Sc I	55	4369.47	Eu II
300	4338.24	Er III	440 h	4348.79	Y I	380	4358.69	Re I	100	4369.50	Cl I
1700	4338.41	Tb I	110	4349.03	Nb I	800	4358.73	Y II	300 r	4369.64	Pm I
9	4338.50	Si III	55	4349.072	Th I	55	4359.08	Sc I	95	4369.68	Ti I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
200	4369.69	Kr II	80	4379.33	Y I	300	4388.23	Tb I	1400	4400.58	V I
300	4369.77	Gd II	12 h	4379.4	Bi II	130	4388.36	Nb I	3000	4400.77	Pa
80	4369.771	Fe I	70	4379.40	Ne II	400 r	4388.49	Pm I	540	4400.83	Nd II
120	4369.86	Ne II	150	4379.55	Ne II	100	4388.76	Cs II	200	4400.986	Ar II
210	4369.92	Sm II	150	4379.667	Ar II	200	4388.76	Pm II	410	4401.17	Sm I
110	4370.66	Os I	240	4379.78	Zr II	45 h	4389.60	Sc I	120	4401.24	Ho II
200	4370.753	Ar II	90	4379.82	Pr III	100	4389.75	Cl I	110	4401.55	Ni I
500	4370.84	Cu III	100	4379.90	Cl I	400	4389.97	Ce III	55	4401.580	Th I
400	4370.91	Cl III	10000	4379.91	Pu II	4800	4389.97	V I	1400	4401.86	Gd I
180	4370.97	Hf II	95	4379.92	Rh I	8	4390.03	Na I	180	4402.50	Ta I
375	4371.17	As II	10	4380.07	Yb III	90	4390.40	Cl I	60	4402.54	Ba I
530	4371.28	Cr I	6	4380.38	Mg I	1700	4390.44	Ru I	160	4402.74	Os I
70	4371.329	Ar II	530	4380.42	Sm I	10	4390.59	Mg II	90	4403.03	Cl I
500	4371.40	Cu III	100	4380.55	V I	250	4390.66	Nd II	810 d	4403.06	Sm II
320	4371.62	Pr II	2	4380.57	Tl III	1600	4390.86	Sm II		4403.13	Sm I
110bl	4371.97	LaO	100	4380.69	Ga III	260	4390.91	Tb I	520	4403.14	Gd I
220	4372.02	Tb I	50	4381.11	Cr I	1100	4391.110	Th II	100	4403.17	Er II
9 h	4372.04	Fe III	90	4381.47	Pr III	140	4391.34	Re I	180	4403.27	Ho I
9 h	4372.14	Fe III	1900	4381.64	Mo I	1700	4391.66	Ce II	410	4403.36	Sm II
45 h	4372.20	Eu II	45	4381.70	Mn I	70	4391.75	Cr I	9	4403.45	Ti IV
2400	4372.21	Ru I	150	4381.76	Ga III	18	4391.83	Pt I	60	4403.50	Cr I
11 h	4372.31	Fe III	1300	4381.860	Th II	200	4391.99	Ne II	170	4403.60	Pr II
60	4372.38	Ti I	200	4381.88	Pm II	280	4392.06	Gd I	2 h	4403.73	Si IV
150	4372.52	W I	910	4382.17	Ce II	18	4392.59	Ir I	65	4403.78	Ir I
14 h	4372.53	Fe III	160	4382.17	Er I	160	4392.69	Nb I	350	4403.85	Cs II
18 h	4372.81	Fe III	330	4382.45	Tb I	250	4392.81	Na II	100	4403.95	W I
150 d	4372.87	In II	285	4382.9	Se II	55	4392.974	Th I	240	4404.28	Ti I
5000	4372.93	Cl II	75	4383.17	Eu II	500 h	4393.20	Xe II	120	4404.71	Pr III
500	4373.02	Cs II	280	4383.44	La Iı	9	4393.34	Na I	1200	4404.750	Fe I
45	4373.04	Rh I	3000	4383.544	Fe I	210	4393.35	Sm I	10000	4404.90	Pu I
140 d	4373.23	V I	2	4384.26	Co II	330	4393.59	U I	60	4404.90	Ti I
70	4373.25	Cr I	290	4384.29	Sm II	60 h	4393.69	Yb I	100	4405.12	Pr II
500	4373.43	Cu III	400	4384.43	Cs II	170	4393.92	Ti I	200	4405.12	Na II
440	4373.46	Sm II	20 l	4384.53	Ac I	10000	4393.93	Pu II	400	4405.23	Ba II
100 l	4373.78	Xe II	9	4384.64	Mg II	30	4394.01	Y I	1000	4405.25	Cs II
350	4373.82	Ce II	300	4384.70	Er II	360cw	4394.38	Re I	21 h	4405.27	Eu II
970	4373.83	Gd I	7000	4384.72	V I	200	4394.42	Tm I	30	4405.68	Ti I
85	4374.123	Th I	130	4384.81	Sc II	30	4394.67	Y I	430	4405.83	Pr II
110	4374.16	Cr I	180 c	4384.83	Ho II	520	4394.86	Os I	6 h	4405.90	Si III
320	4374.24	Dy II	180	4384.85	W I	330	4395.04	Ti II	17	4406.29	Ca III
2000	4374.46	Sc II	530	4384.98	Cr I	3600	4395.23	V I	110cw	4406.40	Re I
320	4374.76	Dy II	50	4385.057	Ar II	9	4395.76	Fe III	2300	4406.64	V I
4200	4374.80	Rh I	100	4385.06	Ne II	500 l	4395.77	Xe II	260	4406.67	Gd II
470 d	4374.93	Nd II	75	4385.10	Te II	220	4395.95	O II	8 h	4406.72	Si III
12000	4374.94	Y II	100	4385.20	La II	120	4395.96	Tm I	200 l	4406.88	Xe II
45	4374.95	Mn I	10000	4385.35	Pu II	60	4396.00	Te II	55	4407.07	Eu II
320	4374.98	Sm II	200	4385.35	P II	270	4396.08	Pr II	2800	4407.64	V I
	4375.04	Nd II	870	4385.39	Ru I	20	4396.23	Ag I	400	4407.94	Be I
200	4375.22	Na II	500	4385.41	Tm III	140	4396.50	Tm I	3600	4408.20	V I
100	4375.30	V I	30	4385.48	Y I	20	4396.71	Ac I	260	4408.25	Gd II
70	4375.33	Cr I	1300	4385.65	Ru I	200	4396.91	Cs II	200	4408.28	W I
150 h	4375.61	Y I	710	4385.66	Nd II	2 h	4396.94	Co II	4600	4408.51	V I
110bl	4375.84	LaO	150	4386.07	Ta I	160	4397.26	Os I	1700	4408.82	Pr II
530	4375.92	Ce II	300	4386.40	Er I	10	4397.33	Ti IV	85	4408.882	Th I
800	4375.929	Fe I	1000 l	4386.41	Ac II	290	4397.34	Sm I	220	4409.25	Gd I
50	4375.954	Ar II	200	4386.42	Cu III	150	4397.99	Ne II	150	4409.30	Ne II
800	4376.121	Kr I	1400	4386.43	Tm I	1800	4398.02	Y II	520	4409.33	Sm II
1000	4377.11	Cu III	20 c	4386.46	Pb II	110	4398.45	Ta I	810	4409.34	Er I
2500	4377.12	Rb II	300 h	4386.54	Kr II	100	4398.62	Hg II	540	4409.38	Dy II
30	4377.12	Te II	700	4386.84	Ce II	200	4398.79	Ce II	400 r	4409.42	Pm I
8 h	4377.63	Si III	20000	4386.86	Er III	510	4399.20	Ce II	1600	4410.03	Ru I
140	4377.96	Nb I	200	4387.49	Na II	160	4399.47	Ir I	350	4410.21	Cs II
110	4378.10	La II	60	4387.50	Cr I	350	4399.50	Cs II	330	4410.21	Nb I
880	4378.24	Sm II	100	4387.74	Y I	19	4399.59	Ca III	24	4410.30	Cr I
200	4378.48	W I	90	4387.88	Eu I	60	4399.77	Ti II	350	4410.64	Ce II
100	4378.82	Ta I	10	4387.929	He I	200	4399.965	Kr I	350	4410.76	Ce II
300	4379.11	N III	310	4388.01	Ce II	70	4400.097	Ar II	510	4411.06	Nd II
170	4379.14	Ho II	30	4388.08	Ti I	1100	4400.37	Sc II	60	4411.09	Cr I
12000	4379.24	V I	7	4388.16	K II	150	4400.55	Ho II	520	4411.16	Gd I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
12	4411.42	Sb II	160	4421.46	Ru I	615	4431.562	As II	2000 s	4441.36	Am II
2500	4411.57	Mo I	640	4421.57	V I	500	4431.685	Kr II	10000	4441.65	Pu II
290	4411.58	Sm I	120	4421.76	Ti I	120	4431.85	Pr III	830	4441.68	V I
1 h	4411.65	Si IV	50	4422.048	Th I	40	4431.89	Ba I	10000	4441.74	Br I
55	4411.88	Mn I	1400	4422.41	Gd I	50	4432.18	Cr I	530	4441.81	Sm I
140	4412.14	V I	110	4422.51	Er II	110	4432.28	Pr II	200	4442.20	Mo I
130	4412.19	W I	890	4422.59	Y II	120 h	4432.32	F III	440	4442.28	Sm I
35	4412.25	Cr I	120	4422.82	Ti I	100	4432.41	Os I	80	4442.55	Pt I
100	4412.41	Cd II	10000	4423.01	Bk I	400	4432.51	Pm II	80	4442.74	Tm I
500 r	4412.47	Pm I	350	4423.10	Tb I	30	4432.60	Ti I	140	4443.00	Zr II
210	4412.741	Th II	160bl	4423.17	LaO	110	4432.72	Tb I	100	4443.66	Y I
3	4412.989	Cd I	7	4423.25	Na I	285	4432.74	N II	230	4443.80	Ti II
190	4413.04	Zr I	210	4423.62	Mo I	250	4432.963	Th II	100	4444.00	Cs II
2000 h	4413.09	Ac III	200	4423.68	Ce II	160bl	4432.98	LaO	640	4444.21	V I
100	4413.22	Ne II	160	4423.90	La I	23	4433.32	Rh I	710	4444.26	Sm II
410	4413.77	Pr II	100	4424.05	Cs II	24	4433.58	Ti I	24	4444.27	Ti I
50	4413.87	Cr I	60	4424.28	Cr I	50	4433.838	Ar II	480	4444.39	Ce II
3	4413.91	Co II	2900	4424.34	Sm II	1600	4433.88	Sm II	150	4444.58	Dy I
860	4414.16	Gd I	24	4424.39	Ti I	11	4433.91	Ti III	130	4444.63	Ho I
700	4414.73	Gd I	320	4424.57	Er I	9	4433.99	Mg II	450	4444.70	Ce II
350	4414.88	Mn I	160	4424.58	Pr II	170	4434.00	Ti I	100	4444.831	Cu II
450	4414.91	O II	1500	4425.14	Br I	50	4434.2	Xe III	710	4445.15	Sm I
300	4415.122	Fe I	100	4425.189	Kr I	1800	4434.32	Sm II	500	4445.41	Pm II
880	4415.56	Sc II	25	4425.44	Ca I	120	4434.81	Eu II	14	4445.55	Pt I
200 h	4415.58	Po	30	4425.83	Ti I	990	4434.95	Mo I	300	4445.91	Gd III
1000	4415.63	Cd II	460	4426.00	V I	26	4434.96	Ca I	285	4446.0	Se II
130	4415.74	Ta I	400	4426.001	Ar II	40	4435.05	Rn I	580	4446.39	Nd II
180	4415.82	Re I	120	4426.06	Ti I	14000cw	4435.56	Eu II	12	4446.48	Sb II
150 l	4416.07	Xe II	110	4426.27	Ir I	25	4435.69	Ca I	160	4446.53	F II
200	4416.27	Tb II	370	4426.77	Er I	350	4435.71	Cs II	130	4446.63	Y I
640	4416.47	V I	310	4427.07	Ce II	250 r	4435.86	Pm I	200	4446.70	Na II
60	4416.54	Ti I	890	4427.10	Ti I	240 d	4436.10	Gd I	170	4446.72	F II
28	4416.845	Th I	615	4427.106	As II	240	4436.12	Tb I	600	4446.90	Pm II
310	4416.90	Ce II	120	4427.24	Zr I	3000	4436.13	Pa	650	4447.03	N II
285	4416.98	O II	600	4427.299	Fe I	430	4436.14	V I	290	4447.18	Nb I
220	4417.28	Ti I	120	4427.31	V I		4436.22	Gd II	180	4447.19	F II
120	4417.35	Hf II	120 h	4427.35	F III	20	4436.27	Ra II	230	4447.35	Os I
380	4417.58	Sm II	260	4427.55	La II	290	4436.32	Os I	200	4447.41	Na II
60	4417.72	Ti II	480	4427.92	Ce II	210	4436.35	Mn I	50	4447.58	Tm I
160	4417.91	Hf I	8	4428.00	Mg II	5	4436.49	Mg II	10000	4447.77	Cm I
1000	4417.96	Pm II	100bl	4428.10	LaO	300 r	4436.55	Pm I	150 w	4447.93	Pr III
220bl	4418.24	LaO	200	4428.171	P III	70	4436.59	Ti I	240	4448.04	Tb I
180	4418.70	Er I	310	4428.44	Ce II	4	4436.60	Mg II	500 h	4448.13	Xe II
980	4418.78	Ce II	330	4428.46	Ru I	600	4436.812	Kr II	160	4448.21	O II
340	4419.03	Gd II	24	4428.50	Cr I	160	4436.90	W I	600	4448.32	Ce III
160	4419.04	Pr II	100	4428.52	Ne II	230 c	4437.22	Nb I	35	4448.879	Ar II
470	4419.33	Sm I	310	4428.52	V I	120 h	4437.27	Au I	840	4449.15	Ti I
190	4419.44	Nb I	100	4428.63	Ne II	80	4437.34	Y I	220	4449.2	Se II
12	4419.60	Fe III	1200 c	4429.13	Pr II	55	4437.40	Tm II	770	4449.34	Ce II
570	4419.61	Er II	650	4429.27	Ce II	3	4437.55	He I	440	4449.34	Ru I
190	4419.65	Pr II	1000	4429.59	Tc I	110	4437.66	Er I	740	4449.70	Dy II
18	4419.66	Eu II	470	4429.66	Sm I	640	4437.84	V I	340	4449.74	Mo I
55	4419.78	Mn I	230	4429.80	V I	100bl	4438.01	LaO	730	4449.83	Pr II
6	4419.89	Na I	2000	4429.90	La II	200	4438.04	Hf I	180 w	4450.14	Pr III
120	4419.94	V I	21	4430.02	Ti I	350 h	4438.04	Sr I	15	4450.18	Ir I
140	4420.19	Tb I	150	4430.189	Ar II	30	4438.23	Ti I	30	4450.49	Ti II
140 h	4420.30	F III	60 h	4430.21	Yb I	100	4438.49	Cl I	620	4450.73	Ce II
240	4420.46	Zr I	85	4430.37	Ti I	300 r	4438.68	Pm I	190	4450.81	Lu I
4900	4420.47	Os I	190 c	4430.48	Lu I	35	4438.79	Lu I	550	4450.90	Ti I
1500	4420.53	Sm II	50	4430.49	Cr I	440	4439.19	Yb I	120 w	4451.00	Pr III
200	4420.56	Ho II	1100	4430.63	Gd I	110	4439.38	Tb I	1400	4451.57	Nd II
10	4420.61	Au II	150	4430.90	Ne II	20	4439.461	Ar II	800	4451.59	Mn I
28	4420.66	Sc II	150	4430.94	Ne II	100	4439.64	Os I	140	4451.90	Pr II
400	4420.71	P II	50	4430.996	Ar II	460	4439.76	Ru I	200	4451.99	Nd II
65 h	4420.96	Lu I	9	4431.02	Fe III	300	4440.10	Rb II	610	4452.01	V I
120	4421.10	Pr III	50	4431.28	Ti I	130	4440.35	Ti I	100	4452.15	La I
960	4421.14	Sm II	17	4431.30	Ca III	30	4440.45	Cd II	160	4452.38	O II
160 c	4421.22	Pr II	45	4431.36	Sc II	140	4440.866	Th II	100	4452.46	P II
100	4421.39	Ne II	160	4431.49	Zr I	50	4441.27	Ti I	25	4452.565	Th I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
1300	4452.73	Sm II	18	4462.46	Ni I	110	4472.85	B II	640	4484.19	W I
300	4452.86	I II	20	4462.73	Ac I	620	4473.02	Sm II	120	4484.57	Ho II
250	4452.95	Sm I	740	4462.99	Nd II	300	4473.23	Pm II	220	4484.70	Gd I
160	4453.00	Mn I	150	4463.00	P II	100	4473.50	Er II	120	4484.76	Os I
840	4453.32	Ti I	70	4463.38	Ti I	100	4473.59	Ho II	300 r	4485.05	Pm I
200	4453.44	Cs II	420	4463.41	Ce II	180	4473.59	Pd I	24	4485.15	Eu II
290	4453.71	Ti I	95	4463.54	Ti I	40	4473.89	Y I	500	4485.27	Ce III
600	4453.917	Kr I	200	4463.668	P III	190	4473.93	Ru I	2	4485.52	Be III
800	4453.95	Pm II	800	4463.689	Kr I	120	4474.04	V I	280	4486.90	Gd I
120	4454.03	Tm I	290	4464.68	Mn I	700	4474.13	Gd I	840	4486.91	Ce II
1200	4454.63	Sm II	300	4464.74	Gd I	500	4474.46	As II	220	4487.05	B III
140	4454.68	Pr II	75 h	4464.97	Eu II	630	4474.56	Mo I	3000	4487.06	Tc I
200	4454.74	Na II	20	4465.27	Y I	200	4474.63	Na II	110	4487.28	Y I
30	4454.78	Ca I	220	4465.341	Th II	200	4474.71	V I	100 h	4487.30	Be III
130	4455.01	Mn I	30	4465.36	Cr I	100	4474.759	Ar II	300	4487.47	Y I
200	4455.23	Na II	50	4465.45	O II	95	4474.85	Ti I	40	4488.05	Cr I
160	4455.32	Mn I	290	4465.81	Ti I	800	4475.014	Kr II	250	4488.25	Au I
950	4455.33	Ti I	100	4465.97	Pr II	150	4475.08	Re I	19	4488.32	Ti II
110	4455.60	Dy II	50 d	4466.28	O II	30	4475.221	Th I	380	4488.89	V I
100	4455.80	La II	140	4466.34	W I	200	4475.26	P II	60 h	4488.98	Ba I
110	4455.82	Mn I	715	4466.348	As II	90	4475.30	Cl I	260	4489.09	Ti I
28	4455.89	Ca I	10000	4466.46	Bk I	170	4475.72	Y I	2 h	4489.12	Co II
300	4456.40	Nd II	300	4466.55	Gd II	80	4476.017	Fe I	20	4489.18	Ca II
20	4456.61	Ca I	120	4466.551	Fe I	50 h	4476.04	Ag I	50	4489.47	Cr I
140	4456.80	Nb I		4466.60	Gd I	860	4476.12	Gd I	50	4489.664	Th I
55	4457.04	Mn I	5	4466.65	K II	25 h	4476.8	Bi II	80	4489.70	Tm II
120	4457.05	Ne II	140	4466.74	W I	180	4476.96	Y I	50	4489.739	Fe I
200	4457.21	Na II	110	4466.91	Zr I	140 c	4477.26	Pr II	400 h	4489.88	Kr II
140	4457.34	Hf I	520	4467.08	Gd I	160	4477.45	Y I	1500	4489.91	Cl II
480	4457.36	Mo I	2200	4467.34	Sm II	200	4477.46	Pm II	200	4490.00	Lu III
140	4457.42	Nb I	280	4467.54	Ce II	300	4477.64	Ho II	170	4490.08	Mn I
1100	4457.43	Ti I	285	4467.6	Se II	20000	4477.72	Br I	200	4490.15	Na II
110	4457.43	Zr I	110	4467.69	Tb I	120	4478.39	Re I	1000	4490.42	Br I
410	4457.48	V I	50	4467.83	O II	55	4478.48	Ir I	300 r	4490.50	Pm I
210	4457.55	Mn I	120	4467.98	P II	350 r	4478.58	Pm I	8	4490.77	Tl II
200	4457.68	Cs II	50	4467.98	Tm I	170	4478.63	Te II	200	4490.87	Na II
120	4457.76	V I	120	4468.01	V I	740	4478.66	Sm II	230	4491.28	Mo I
85	4458.002	Th I	250	4468.14	Dy II	220	4478.80	Gd II	30	4491.75	Y I
270	4458.26	Mn I	250 r	4468.16	Pm I	200	4478.80	Na II	250	4492.05	Pm II
715	4458.469	As II	240	4468.50	Ti II	10	4479.23	Ca II	60	4492.31	Cr I
1000	4458.52	Sm II	10000	4468.54	Pu II	700	4479.36	Ce II	25	4492.42	Y I
110	4458.54	Cr I	960	4468.66	Pr II	40	4479.40	Mn I	35	4492.47	Rh I
85	4459.04	Ni I	50	4469.41	O II	95	4479.70	Ti I	24	4492.55	Ti I
10000	4459.16	Cm I	1000	4469.47	Rb II	250	4479.776	P III	430	4493.07	Tb I
200	4459.18	Cs II	90	4469.56	Co I	650	4479.89	Al III	800	4493.21	Po I
100	4459.24	Er II	140	4469.71	Nb I	650	4479.97	Al III	50 h	4493.64	Ba I
50	4459.25	Rn I	380	4469.71	V I	140 h	4479.99	F III	100	4493.66	Cs II
250	4459.29	Sm I	200	4470.14	Mn I	150	4480.45	Ru I	10000	4493.78	Pu II
30	4459.74	Cr I	110	4470.31	Zr I	50	4480.59	Ti I	400 c	4493.92	Rb II
1000	4459.76	V I	55	4470.48	Ni I	500 l	4480.86	Xe II	6	4494.05	Si III
200	4459.97	Pm II	190	4470.56	Zr I	280	4481.06	Gd II	10	4494.18	Na I
80	4459.99	Tm I	15	4470.58	Hg III	14	4481.16	Mg II	800	4494.230	As II
1100	4460.04	Ru I	810	4470.89	Sm I	530	4481.26	Ti I	40	4495.01	Ti I
2400	4460.21	Ce II	1400	4471.24	Ce II	540	4481.26	Tm II	400	4495.03	Tc I
2000	4460.29	V I	240	4471.24	Ti I	13	4481.33	Mg II	1	4495.09	Be III
55	4460.38	Mn I	140	4471.29	Nb I	1000	4481.53	Tc I	16	4495.35	Ir I
140	4460.49	W I	200	4471.479	He I	300 r	4481.60	Pm I	11 h	4496.03	Ir I
120	4461.02	Pr III	200	4471.48	Pm II	200	4481.67	Na II	100	4496.06	V I
340	4461.075	As II	50 h	4471.55	Lu I	200	4481.811	Ar II	10	4496.15	Pb IV
150	4461.08	Mn I	25	4471.68	He I	80	4482.169	Fe I	240	4496.15	Ti I
450	4461.14	Ce II	20	4472.04	Ca II	75	4482.169	Th I	130	4496.39	Er I
140	4461.18	Hf I	110	4472.10	B II	200	4482.252	Fe I	1100	4496.46	Pr II
400	4461.652	Fe I	600	4472.33	U II	85 h	4482.42	Yb I	660	4496.86	Cr I
200	4461.81	Pr III	470	4472.43	Sm II	10	4482.50	Co II	200	4496.97	Zr II
510	4462.02	Mn I	140	4472.53	Nb I	95	4482.69	Ti I	500	4497.13	Gd I
21	4462.09	Ti I	10000	4472.61	Br I	30	4482.88	Cr I	220	4497.32	Gd I
100 w	4462.1	Xe III	450	4472.72	Ce II	200	4482.97	La III	4 h	4497.44	Co II
1000 h	4462.19	Xe II	130	4472.79	Mn I	220	4483.33	Gd II	11	4497.66	Na I
610	4462.36	V I	10000	4472.79	Pu II	700	4483.90	Ce II	360	4497.73	B III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
24	4497.73	Ti I	100	4510.733	Ar I	100	4522.72	Ne II	130 c	4531.65	Ho II
140 h	4497.8	Be III	140	4510.82	Ho I	500	4522.73	Re I	45 h	4531.83	Tb II
250	4497.85	Ce II	90	4510.91	N III	130	4522.74	Er I	80	4532.15	Tm I
350	4498.14	Ru I	360 c	4510.98	Ta I	1000	4522.80	Ti I	110	4532.49	Ce II
50	4498.73	Cr I	50	4511.17	Ti I	300	4522.82	Gd II	30	4533.11	Ra II
25	4498.76	Pt I	18000	4511.31	In I	10000	4522.84	Tc I	2 h	4533.22	Co II
60 h	4498.85	Lu I	120	4511.33	Sm I	150	4522.85	Cs II	6000	4533.24	Ti I
240	4498.90	Mn I	150 h	4511.52	Tb I	440	4523.04	Sm II	200	4533.32	Na II
110	4498.940	Th I	560	4511.83	Sm II	770	4523.08	Ce II	500 l	4533.79	Rb II
300	4499.05	La III	95	4511.90	Cr I	400 h	4523.14	Kr II	290	4533.80	Sm I
370	4499.11	Sm I	140	4512.15	Mo I	60 h	4523.17	Ba I	240	4533.97	Ti II
200	4499.24	P II	760	4512.56	Al III		4523.18	Sm I	45	4534.13	Tb I
6	4499.34	Pb III	780	4512.74	Ti I	200	4523.32	Pm I	340 c	4534.15	Pr II
370	4499.48	Sm II	130	4512.88	W I	530	4523.41	Nb I	6	4534.29	Mg II
200	4499.62	Na II	45	4512.96	Tb II	120	4523.88	Re I	170	4534.58	Ho I
19	4499.88	Ca III	120	4513.25	W I	650	4523.91	Sm II	16	4534.60	Pb IV
600	4500.15	Pm II	2600	4513.31	Re I	150	4524.12	Gd I	3600	4534.78	Ti I
70	4500.30	Cr I	170	4513.34	Nd II	140	4524.22	V I	50	4535.15	Cr I
300 w	4500.31	Pr III	3000	4513.44	Br I	230	4524.34	Mo I	40	4535.255	Th I
350 r	4500.33	Pm I	100	4513.56	Pm II	40	4524.74	Sn I	2400	4535.58	Ti I
10 d	4500.54	Co II	50	4513.58	Y I	130	4524.93	Ba II	45 h	4535.59	Eu I
200	4500.75	Er II	80	4514.01	Y I	200	4524.98	Na II	240	4535.72	Cr I
150 c	4500.78	In II	75	4514.31	Tb II	45	4525.01	Tb II	1000	4535.73	Ce III
50	4501.11	Cr I	12	4514.37	Cr I	600	4525.20	Pm II	610	4535.75	Zr I
200	4501.27	Ti II	15	4514.50	Sb II	170	4525.31	La II	340	4535.92	Pr II
1000	4501.52	Cs II	140	4514.50	Gd II	15000	4525.59	Br I	1200	4535.92	Ti I
22	4501.79	Cr I	35	4514.53	Cr I		4526.10	Sr II	1200	4536.05	Ti I
410	4501.82	Nd II	120	4514.86	N III	24	4526.11	Cr I	10000	4536.15	Pu II
120	4501.95	V I	440	4515.09	Sm II	420	4526.12	La II	270	4536.51	Sm II
240	4502.22	Mn I	85	4515.16	Yb II	250 r	4526.12	Pm I	400	4536.80	Mo I
600	4502.353	Kr I	240	4515.28	U II	100 c	4526.14	Ho II	80	4537.07	Te II
150	4503.04	Nb I	100	4515.50	Cs II	100	4526.19	Cl I	45	4537.14	Tb I
240	4503.38	Sm I	19	4515.62	Ti I	380	4526.47	Cr I	45	4537.23	Tb I
29	4503.78	Rh I	110	4515.86	Ce II		4526.6	Be I	24	4537.23	Ti I
40	4503.78	Ti I	1000	4515.98	Tc I	1000	4526.72	Cs II	10	4537.754	Ne I
160	4504.84	W I	150	4516.049	Cu II	250 r	4526.76	Pm I	910	4537.81	Gd I
120	4504.90	Mo I	250	4516.36	Nd II	23	4526.94	Ca I	0 h	4537.95	Co II
10000	4504.91	Pu II		4516.45	Li II	120	4527.25	Nd I	710	4537.95	Sm II
180	4505.05	Sm II	18	4516.59	Ca III	890	4527.25	Y I	150	4538.53	Sm II
55	4505.216	Th I	260	4516.64	Re I	780	4527.31	Ti I	800	4538.94	Cs II
6	4505.33	K II	0	4516.65	Co II	70 d	4527.34	Cr I	110	4539.07	Ce II
40	4505.92	Ba I	220	4516.89	Ru I	840	4527.35	Ce II	24	4539.10	Ti I
500	4505.95	Y I	230	4517.13	Mo I		4527.47	Cr I	2000	4539.53	Tc I
400	4506.002	Cu II	200	4517.31	Pm I	100 d	4527.58	Dy I	615	4539.74	As II
430	4506.21	Gd I	200 c	4517.58	Pr II	400 r	4527.70	Pm I	840	4539.75	Ce II
140	4506.33	Gd II	100	4517.58	Yb III		4527.76	Dy II	40	4539.79	Cr I
21	4506.36	Ti I	220	4517.82	Ru I	440	4527.80	Y I	220	4540.02	Gd II
100	4506.41	Ce I	1000	4518.03	Ti I	840	4528.47	Ce II	300	4540.06	Pm I
350	4506.55	Br III	3300	4518.57	Lu I	50	4528.613	Fe I	290	4540.19	Sm II
200	4506.59	Nd II	95	4518.70	Ti I	23	4528.72	Rh I	10	4540.22	Ti III
200	4506.71	Cs II	700	4519.04	Rb II	550	4528.94	Al III	250	4540.288	P IV
100	4506.83	Cs II	200	4519.21	Na II	870	4529.19	Al III	10	4540.380	Ne I
250	4506.84	Pm I	100	4519.59	Ce II	800	4529.21	Pm II	240	4540.50	Cr I
24	4506.85	Cr I	150	4519.60	Tm I	180	4529.38	Tm II	240	4540.72	Cr I
12	4506.92	Sb II	880	4519.63	Sm II	120	4529.40	Mo I	400	4540.74	Rb II
200	4506.97	Na II	1100	4519.66	Gd I	300	4529.60	Br II	140	4540.93	Hf I
120 c	4507.04	Re I	45	4519.72	Tb II	45	4529.76	Tb	150	4541.032	Cu II
550	4507.12	Zr I	200	4519.74	Br III	24	4529.85	Cr I	35	4541.07	Cr I
1000 l	4507.20	Ac II	12	4520.90	Pt I	120	4529.95	Re I	250	4541.112	P IV
850	4507.659	As II	110	4520.95	Ru I	170	4530.08	Ho II	340	4541.27	Nd II
50	4508.48	Rn I	24	4521.14	Cr I	22	4530.319	Th I	300 r	4541.42	Pm I
45 d	4509.04	Tb II	70	4521.194	Th I	3000	4530.34	Rb II	19	4541.51	Cr I
100	4509.38	Pm II	100 l	4521.86	Xe II	360	4530.41	N II	7	4541.63	Na I
5000 l	4509.45	Am II	1000	4521.92	Ce III	20	4530.552	Ar II	100	4541.66	Dy II
40	4509.58	In III	40 h	4522.05	Y I	380	4530.74	Cr I	450 r	4541.75	Pm I
200	4509.63	Ba II	20	4522.323	Ar I	120	4530.81	P II	300	4542.03	Gd I
120	4510.10	Ru I	850	4522.37	La II	190	4530.85	Ta I	380	4542.06	Sm II
790	4510.15	Pr II	3000	4522.57	Eu II	690	4530.96	Co I	400	4542.09	Tc I
280	4510.527	Th II	260	4522.57	Tm II	170 c	4531.28	Ho I	490	4542.22	Zr I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
65	4542.55	Sc I	5400	4554.51	Ru I	120	4565.51	Cr I	210	4578.69	Tb II
340	4542.61	Nd II	200	4554.63	Pm I	140	4565.59	Co I	140	4578.73	V I
24	4542.62	Cr I	120	4554.83	P II	420	4565.84	Ce II	200	4578.89	Nd II
500	4542.92	Br II	24	4555.08	Ti I	170	4565.85	Ta I	10	4579.051	Pb II
715	4543.483	As II	200	4555.13	Zr I	250	4565.94	Hf I	1	4579.13	Sn II
150	4543.54	W I	400 c	4555.276	Cs I	470	4566.21	Sm II	200	4579.32	Nd II
620	4543.63	U II	500 r	4555.34	Pm I	150	4566.98	Cs II	400	4579.350	Ar II
810	4543.95	Sm II	10 d	4555.46	Ti III	40	4567.11	Tm II	300 r	4579.48	Pm I
500 r	4544.08	Pm I	720	4555.49	Ti I	25	4567.82	Si III	280	4579.59	Gd I
16	4544.27	Rh I	140	4555.52	Zr I	160	4567.91	La I	80	4579.64	Ba I
100	4544.32	Y I	100	4555.73	Th III	35	4568.09	Ir I	360	4580.06	Cr I
140	4544.62	Cr I	70	4555.812	Th I	300 r	4568.14	Pm I	200	4580.06	La II
90	4544.68	Sc I	500	4555.920	Cu II	130	4569.00	Rh I	1	4580.29	Sn II
720	4544.69	Ti I	20 h	4556.0	Ag I	100	4569.06	Ne II	640	4580.40	V I
100	4544.83	Sm II	200	4556.06	Pm I	100 w	4569.1	Xe III	120	4580.68	Re I
210	4544.96	Ce II	100	4556.14	Nd II	1	4569.26	Co II	300	4581.14	Pm I
400	4545.052	Ar II	50	4556.17	Cr I	95	4569.64	Cr I	410	4581.29	Gd I
200	4545.17	Pm I	110	4556.46	Tb I	3000 h	4569.87	Ac III	35	4581.32	Y I
100	4545.17	Re I	200 h	4556.61	Kr II	18	4570.02	Ir I	23	4581.40	Ca I
8	4545.19	Na I	40	4556.68	Tm II	200	4570.02	La I	23	4581.47	Ca I
24	4545.34	Cr I	300	4557.03	Pm I	100 w	4570.1	Xe III	290	4581.58	Sm I
360	4545.39	V I	1000	4557.05	Tc I	200	4570.37	Pm I	190	4581.60	Co I
55	4545.68	Ir I	120 h	4557.24	Sc I	140	4570.64	W I	480	4581.62	Nb I
30	4545.915	Th II	100	4557.78	Te II	140 c	4570.85	In II	120	4581.71	P II
600	4545.96	Cr I	19	4557.86	Ti I	35	4570.91	Ti I	440	4581.73	Sm I
150	4546.47	W I	120	4558.07	P II	65	4570.972	Th I	30	4581.77	Y I
480	4546.82	Nb I	120	4558.08	Gd II	28	4571.10	Mg I	10	4582.27	Pb II
170	4547.33	Ru I	110	4558.11	Mo I	7	4571.21	Pb III	100	4582.29	Zr I
110	4547.85	Ru I	19	4558.11	Ti I	14	4571.31	Rh I	200	4582.36	Yb I
	4548.	Be I	400	4558.46	La II	120	4571.68	Cr I	420	4582.50	Ce II
240	4548.00	Gd I	22	4558.66	Cr II	20000	4571.77	Rb II	130	4582.53	Gd II
150	4548.056	P IV	300	4559.21	Pm I	200	4571.78	V I	300	4582.978	Kr II
200	4548.449	P IV	1 h	4559.29	Co II	150	4571.79	Cs II	410	4583.07	Gd I
30	4548.48	Ir I	110	4559.29	La II	240	4571.98	Ti II	11	4583.83	Fe II
110	4548.60	Tm I	100	4559.37	Y I	18	4572.12	Ca III	1700	4584.44	Ru I
110	4548.66	Os I	170	4559.67	Nd I	300 r	4572.15	Pm I	560	4584.83	Sm II
35	4548.73	Rh I	60	4559.92	Ti I	15 d	4572.20	Ti III	65	4584.84	Tb II
950	4548.77	Ti I	110	4559.98	Ru I	1100	4572.28	Ce II	300 r	4585.49	Pm I
110 c	4549.01	In II	650	4560.28	Ce II	12	4572.66	Be I	150	4585.82	Al II
110	4549.07	Tb I	240	4560.43	Sm II	720	4573.08	Nb I	19	4585.84	Ti
240	4549.63	Ti II	280	4560.71	V I	55	4573.19	Tb II	24	4585.87	Ca I
100	4549.65	V I	30	4560.84	Bi III	60 h	4573.56	Y I		4585.91	Sr II
90	4549.66	Co I	19	4560.89	Rh I	130	4573.81	Gd I	24	4585.96	Ca I
45	4549.72	Tb II	24 b	4560.95	LuO	40	4573.85	Ba I	24	4586.14	Cr I
400 r	4549.78	Pm I	310	4560.96	Ce II	160 h	4573.99	Sc I	830	4586.36	V I
1500 w	4549.80	La IV	30	4561.54	Bi III	340	4574.31	Ta I	100	4586.62	Nd I
15	4549.84	Ti III	40	4561.86	Tm II	20	4574.76	Si III	160	4586.99	Gd I
540	4550.41	Os I	55	4562.24	Tb II	400	4574.88	La II	500	4588.04	P II
110	4550.45	Tb I	2100	4562.36	Ce II	22	4575.12	Cr I	110	4588.19	Al II
13	4550.78	Ir I	200	4562.52	Ho I	400 r	4575.27	Pm I	50	4588.426	Th I
250	4551.30	Ce II	50	4562.63	Ti I	24 b	4575.31	LuO	170	4588.73	W I
140	4551.30	Os I	200	4563.12	Pr II	490	4575.52	Zr I	70	4589.21	Yb I
200	4551.53	Na II	340	4563.22	Nd II	5000 l	4575.59	Am II	50	4589.28	Th III
40	4551.64	Rh I	160	4563.26	Er II	3000	4575.74	Br I	2100	4589.36	Dy I
150	4551.82	W I	35	4563.43	Ti I	260	4575.91	Gd I	500	4589.86	P II
130	4551.95	Ta I	40	4563.660	Th I	640	4576.21	Yb I	400	4589.898	Ar II
400	4552.20	Tc I	110	4563.69	Tb II	210	4576.50	Mo I	24	4589.95	Ti II
35	4552.42	Pt I	110	4563.77	Ti II	300	4576.90	Ce III		4590.	Li
950	4552.46	Ti I	85 h	4563.95	Yb I	510	4577.17	V I	140	4590.55	Zr I
30	4552.62	Si III	19	4564.17	Cr I	800	4577.209	Kr II	140	4590.83	Yb I
410	4552.66	Sm II	30	4564.39	Y I	590	4577.69	Sm II	160	4590.92	Na II
12	4552.84	Hg III	20	4564.405	Ar II	50	4577.72	Rn I	360	4590.97	O II
800	4552.85	Tc I	370	4564.53	Nb I	420	4577.78	Dy I	110	4591.10	Ru I
200	4553.01	Zr I	2000	4564.54	Tc I	180 w	4578.02	In II	130	4591.12	Ce II
35	4553.58	Yb II	80	4564.68	Tm I	300	4578.28	Pm I	170	4591.22	V I
8	4554.00	Si III	100	4564.83	Pm II	180 w	4578.40	In II	360	4591.39	Cr I
65000	4554.03	Ba II	30	4564.85	Tb II	200 r	4578.41	Pm I	65	4591.56	Tb II
300 r	4554.03	Pm I	140	4565.09	Dy I	1000	4578.45	Tc I	290	4591.82	Sm II
270	4554.45	Sm II	16	4565.19	Rh I	22	4578.55	Ca I	30	4591.89	Sb III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
45	4592.38	Tb I	18	4604.48	Ir I	45 h	4615.92	Tb II	75 d	4626.32	Tb II
150	4592.52	Ru I	400	4604.59	Pm I	300	4615.94	Tm II	80	4626.33	Tm II
35	4592.53	Ni I	55 h	4604.72	Sc I	140 c	4616.08	In II	210	4626.41	Zr I
150 h	4592.80	Kr II	15	4604.77	Sb II	150	4616.13	Cs II	460	4626.47	Mo I
65 h	4592.94	Sc I	95	4604.80	Y I	600	4616.14	Cr I	50	4626.48	V I
200 c	4593.169	Cs I	40	4604.85	Tm I	170	4616.17	Nb I	80	4626.54	Mn I
1000 s	4593.31	Am II	65	4605.00	Ni I	5	4616.30	Co II	95	4626.56	Tm II
1000	4593.35	Tc I	80	4605.36	Mn I	75	4616.39	Ir I	300	4626.70	P II
380	4593.54	Sm II	85 c	4605.39	Lu I	170	4616.78	Os I	95	4626.94	Tb II
200	4593.82	Pm I	8	4605.40	Pb IV	1000	4616.86	Tc I	40	4626.97	Tm I
840	4593.93	Ce II	500	4605.45	Ac II	600 r	4617.02	Pm I	240	4627.07	U II
11000	4594.03	Eu I	600 r	4605.66	Pm I	170 c	4617.17	In II	9800	4627.22	Eu I
1300	4594.11	V I	120	4605.73	Re I	60	4617.26	Dy II	170 c	4627.30	In II
8 d	4594.42	Sc IV	160	4605.78	La II	950	4617.27	Ti I	100	4627.48	Mo I
170	4595.16	Mo I	100	4606.15	V I	27	4617.49	Tb I	500	4627.60	Ce III
560	4595.29	Sm II	18	4606.23	Ni I	15	4618.11	Ti IV	400 r	4627.60	Pm I
75	4595.421	Th I	90	4606.33	N IV	200	4618.40	Pm I	100	4627.98	Nd I
70	4595.59	Cr I	420	4606.40	Ce II	400 r	4618.49	Pm I	1700	4628.16	Ce II
5	4595.65	K II	290	4606.51	Sm II	100	4618.84	Ho I	3000	4628.19	Pa
400 r	4595.82	Pm I	1000	4606.61	Er I	35	4619.06	Tm II	100 c	4628.22	Ho I
15	4596.097	Ar I	1200	4606.77	Nb I	1000	4619.166	Kr II	25 h	4628.33	Ba I
285	4596.17	O II	450	4607.16	N II	30	4619.36	Tb II	7	4628.441	Ar I
1	4596.45	Pb III	65000	4607.33	Sr I	260	4619.51	Ta I	3 h	4628.62	Si IV
130	4596.55	Y I		4607.34	Li II	24	4619.52	Ti I	270 c	4628.74	Pr II
95	4596.63	Tm I	900 h	4607.51	Au I	70	4619.55	Cr I	290	4629.10	Ho II
240	4596.74	Sm I	29	4608.12	Rh I	7	4619.66	Si III	190	4629.34	Ti I
30	4596.90	Sb II	500	4608.21	Cl III	500 r	4619.75	Pm I	120	4629.38	Co I
100	4596.906	Cu II	10000	4608.40	Cm I	230	4619.77	V I	340	4629.787	As II
220	4596.98	Gd II	8	4608.45	K II	410	4619.88	La II	35	4629.81	Zn I
200	4597.02	Nd II	300 c	4609.16	Tc I	14	4619.91	Rh I	450	4630.11	Nb I
800	4597.55	Pm I	120cw	4609.32	Ho II	20 h	4619.92	Ba I	150	4630.21	Sm II
320	4597.91	Gd II	21	4609.37	Ti I	250	4619.98	N V	870	4630.54	N II
40	4598.36	Yb II	50	4609.38	Rn I	140	4620.03	Dy II	1000	4630.57	Tc I
65 h	4598.45	Sc I	80 d	4609.39	O II	80	4620.04	Ag II	70	4630.62	Te II
500 d	4598.80	Hf I	45	4609.53	Sc I	250 c	4620.14	In II	160	4630.88	Er II
410	4598.90	Gd I	550	4609.567	Ar II	300	4620.21	U I	200	4630.93	Pm I
270	4599.02	Tm I	30	4609.65	V I	50	4620.46	Ag II	9 h	4631.24	Si IV
330	4599.08	Ru I	500 r	4609.85	Pm I	100 h	4620.56	Au I	210	4631.62	U I
20	4599.09	Sb II	100	4609.87	Nd I	150 w	4620.70	In II	140	4631.761	Th II
60	4599.23	Ti I	360	4609.88	Mo I	230	4620.86	Hf I	140	4631.761	Th II
30	4599.75	Ba I	140	4609.89	W I	30	4621.163	Th I	170	4631.83	Os I
200	4599.77	I II	45	4609.95	Sc I	3	4621.30	Mg I	350 c	4631.89	Rb II
140	4599.94	W I	100	4609.99	Cs II	100	4621.38	Mo I	65	4632.07	Tb I
50	4600.10	Cr I	1 h	4611.27	Si IV	100	4621.38	Re I	24	4632.18	Cr I
500 r	4600.25	Pm I	350	4611.44	Po I	450	4621.39	N II	140	4632.28	Pr I
18	4600.37	Ni I	25	4611.74	V I	100	4621.42	Si II	170	4632.32	Ce I
480	4600.75	Cr I	30	4611.96	Tb I	500	4621.57	Pm I	300 c	4632.45	I II
80	4600.98	Cl I	450 w	4612.02	Pr III	150	4621.72	Si II	200	4633.15	Tc I
50	4601.02	Cr I	140	4612.08	Pr II	40	4621.72	Tm I	600 r	4633.45	Pm I
340	4601.05	Gd II	990	4612.26	Dy I	300	4621.94	Nd I	800	4633.885	Kr II
35	4601.29	Tm II	26	4612.554	Th II	85	4621.96	Cr I	700	4633.98	Zr I
300	4601.36	Br II	30	4612.93	Er III	3000 c	4622.42	Rb II	90	4634.14	N III
3000 s	4601.43	Pa II	40	4613.00	Y I	70	4622.49	Cr I	510	4634.24	Nd I
550	4601.48	N II	160	4613.30	W I	200 c	4622.69	Tc I	110	4634.26	Tm II
600	4602.08	P II	240	4613.37	Cr I	350	4622.70	Br II	50 d	4634.87	Ti
615	4602.427	As II	130	4613.37	Ho I	24	4622.76	Cr I	100	4635.18	V I
350	4602.57	Zr I	410	4613.39	La II	350	4623.09	Cs II	140	4635.68	Pr I
21	4602.63	Eu I	50	4613.83	Dy I	480	4623.09	Ti I	170	4635.69	Ru I
13	4602.83	Li I	360	4613.87	N II	500	4623.31	Pm I	65 h	4636.59	Tb I
13	4602.89	Li I	50	4613.97	Tm I	700 r	4623.68	Pm I	430	4636.64	Gd I
240	4602.93	Gd I	40	4614.47	Tm II	40	4623.938	Cl I	30	4636.99	Tb II
400 r	4602.96	Pm I	520	4614.50	Gd I	900	4624.41	Pm I	140 c	4637.04	In II
55	4603.43	Tm II	2500	4614.58	Br I	65	4624.41	V I	40	4637.18	Cr I
350	4603.73	N V	50	4614.82	Dy I	140	4624.42	Gd I	35	4637.233	Ar II
2500	4603.76	Cs II	500	4615.292	Kr II	420	4624.90	Ce II	3000	4637.50	Tc I
100	4603.82	Nd I	290	4615.44	Sm II	300	4624.96	Tc I	50	4637.77	Cr I
45 h	4604.10	Tb II	470	4615.69	Sm II	600 w	4625.18	Pr III	60	4637.88	Ti I
220	4604.18	Sm II	30 h	4615.69	Ag I	500 r	4625.29	Pm I	220	4637.9	Se III
140	4604.42	Zr I	100	4615.87	Pm II	550	4626.19	Cr I	380 c	4638.16	In II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
7	4638.28	Si III	100 h	4648.21	Lu I	85 h	4659.03	Lu I	470 d	4670.75	Sm I
160	4638.85	O II	2000	4648.33	Tc I	500	4659.28	Rb II	60	4670.82	Y I
110	4639.00	Gd II	10000	4648.57	Rb II	5	4659.38	K II		4670.83	Sm I
40	4639.14	Yb III	170 d	4648.59	Gd I	300	4659.38	Pm I	140 h	4670.87	Gd I
240	4639.37	Ti I	75	4648.66	Ni I	640	4659.87	W I	500 r	4671.23	Pm I
50 d	4639.52	Cr I		4648.70	Gd I	2000 c	4660.21	Tc I	100	4671.40	U II
200	4639.55	Pr I	95 h	4648.85	Lu I	90	4660.28	Hg II	0	4671.51	Li II
220	4639.67	Ti I	24	4648.87	Cr I	25 h	4660.66	Co II	6	4671.65	Li II
	4639.70	Cr I	30	4648.89	V I	500 r	4660.79	Pm I	35	4671.69	Mn I
190	4639.95	Ti I	450	4648.95	Nb I	80	4661.208	Cl I	2	4671.70	Li II
8 d	4639.96	Sc IV	100 l	4649.12	Am I	130 c	4661.33	Ho II	320	4671.702	Cu II
170	4640.04	Gd I	450	4649.14	O II	120	4661.363	Cu II	400	4671.76	Pm I
65	4640.07	V I	110	4649.27	Nb I	360	4661.64	O II	160	4671.83	La II
110	4640.60	Er II	120	4649.271	Cu II	630bl	4661.75	LuO	130	4671.90	Mo I
120	4640.64	N III	10	4649.45	Ti III	8300	4661.88	Eu I	35	4671.99	Tm II
65	4640.74	V I	35	4649.46	Cr I	8	4662.352	Cd I	580	4672.09	Nb I
400 r	4640.96	Pm I	380	4649.49	Sm I	360	4662.51	La II	270 c	4672.09	Pr II
85	4641.00	Tb II	300	4649.67	Nd I	50	4662.72	Dy I	400	4672.17	Tc I
340	4641.10	Nd I	200 c	4649.77	Ho II	220	4662.76	Mo I	310bl	4672.31	LuO
100	4641.12	Te II	120	4650.02	Ti I	5000 l	4662.79	Am I	310	4673.16	Er I
30	4641.254	Th I	520	4650.25	C III	80	4662.79	Tb I	2 h	4673.30	Si IV
8	4641.29	Ra I	600 r	4650.42	Pm I	23	4663.202	Th I	700	4673.33	Be II
100 w	4641.4	Xe III	110	4650.51	Ce I	300 r	4663.26	Pm I	1000	4673.42	Be II
360	4641.81	O II	500	4650.52	Pm I	40	4663.33	Cr I	300	4673.577	Cu II
10	4641.88	K I	160	4650.84	O II	85	4663.41	Co I	85	4673.60	Dy II
210	4641.98	Tb II	2000	4651.12	Cu I	600 r	4663.46	Pm I	30	4673.62	Ba I
300	4642.02	Br II	570	4651.28	Cr I	290	4663.56	Sm I	30	4673.7	Xe III
880	4642.24	Sm II	375	4651.47	C III	230	4663.76	La II	10	4674.36	Ge III
11	4642.37	K I	200 c	4651.50	Pr II	140	4663.82	Os I	500 r	4674.42	Pm I
100	4642.53	W I	140	4651.558	Th II	70	4663.83	Cr I	1100	4674.60	Sm II
40	4642.96	Tm II	300	4651.98	Br II	450	4663.83	Nb I	140 c	4674.62	Ho II
550	4643.08	N II	840	4652.16	Cr I	1	4663.92	Au I	2000	4674.84	Y I
95	4643.12	Tm I	12	4652.86	Ti III	3	4663.97	Au I	150	4675.03	Rh I
23	4643.18	Rh I	400 r	4653.41	Pm I	140	4664.65	Pr II	35	4675.10	Tm I
500	4643.28	Tc I	100 l	4653.45	Am I	110	4664.66	Dy II	70	4675.12	Ti I
700 r	4643.36	Pm I	430	4653.54	Gd I	95	4664.80	Cr I	80	4675.31	Tm I
110 c	4643.49	Pr II	65 b	4654.03	LuO	400 r	4665.19	Pm I	530	4675.37	Nb I
2000	4643.70	Y I	50	4654.040	Cl I	110	4665.44	Er II	1000	4675.53	I II
700 r	4643.76	Pm I	120	4654.16	Pr III	50 c	4665.45	Tb I	570	4675.62	Er II
300	4644.10	Ba II	130	4654.29	Ce II	200	4665.86	C III	20	4675.74	Sb II
220 c	4644.58	In II	290	4654.32	Ru I	8	4665.87	Si III	65	4676.056	Th I
35	4644.58	Tm I	10 h	4654.32	Si IV	35	4665.90	Cr I	285	4676.23	O II
210	4644.83	Zr I	180	4654.37	Te II	30	4666.14	V I	80	4676.90	Tb I
200	4645.09	Ru I	400	4654.50	Pm I	22	4666.22	Cr I	680	4676.91	Sm II
140	4645.19	Ti I	200	4654.73	Nd I	340	4666.24	Nb I	200	4677.46	Pm I
110	4645.28	La II	35	4654.74	Cr I	500 d	4666.48	I II	30 h	4677.60	Ag I
260cw	4645.31	Tb II	500 r	4655.05	Pm I	70	4666.51	Cr I	40	4677.86	Tm II
290	4645.40	Sm I	120	4655.09	Tm I	35	4666.70	Tm II	500 r	4677.92	Pm I
95 h	4645.47	Lu I	150	4655.13	Sm II	550	4666.80	Al II	3	4678.06	Li II
250	4645.77	Nd II	210	4655.19	Hf I	140	4666.85	U II	400 r	4678.09	Pm I
400	4645.94	Pm I	540	4655.50	La II	1 h	4667.14	Si IV	200	4678.149	Cd I
170	4646.00	Gd I	360 c	4655.62	In II	240	4667.22	Nb I	1	4678.29	Li II
140	4646.05	Pr II	24	4656.04	Ti I	85	4667.47	Y I	60	4678.35	Y I
1600	4646.17	Cr I	26	4656.18	Ir I	840	4667.59	Ti I	110	4678.48	Nb I
200	4646.40	Nd I	19	4656.19	Cr I	60 h	4668.48	Ag I	500	4678.70	Br II
130	4646.40	V I	720	4656.47	Ti I	200	4668.91	La II	200	4678.90	Tc I
500	4646.51	Cs II	150	4656.54	Cs II	17 h	4668.99	Ir I	150	4679.06	Er II
220	4646.60	U II	320 w	4656.74	In II	130	4669.14	Ta I	170	4679.18	Gd I
290	4646.68	Sm II	3 h	4656.92	Si IV	2000	4669.30	Tc I	260	4680.04	Gd I
24	4646.81	Cr I	130	4657.42	W I	50	4669.34	Cr I	150	4680.13	Ce II
600 r	4647.03	Pm I	400	4657.901	Ar II	740	4669.40	Sm II	300	4680.14	Zn I
80	4647.23	Tb I	1000	4658.02	Lu I	40	4669.40	Tb I	500	4680.406	Kr II
30	4647.32	Sb II	200 w	4658.30	C IV	110	4669.50	Ce II	40 h	4680.49	Sc I
600	4647.42	C III	300	4658.31	P II	620	4669.65	Sm II	640	4680.51	W I
30	4647.433	Fe I	200 h	4658.32	Y I	50	4669.984	Th I	40	4680.54	Cr I
720	4647.61	Ru I	60	4658.38	Tb I	350	4670.28	Cs II	170	4680.74	Nd II
170	4647.64	Gd I	20	4658.73	Tb	350	4670.40	Sc II	19	4680.87	Cr I
24	4648.13	Cr I	2000	4658.876	Kr II	160	4670.49	V I	190 c	4681.11	In II
240	4648.16	Sm II	70	4658.89	Y I	130	4670.56	Nd II	210	4681.55	Sm I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
2000 l	4681.65	Am I	30 h	4693.39	Tb II	340	4707.586	As II	210	4719.12	Zr I
290	4681.79	Ru I	130	4693.63	Sm II	110	4707.79	Zr I	4000 c	4719.28	Tc I
70 c	4681.87	Tb I	40	4693.68	Ti I	110	4707.94	Tb II	350	4719.76	Br II
450	4681.88	Ta I	100	4693.72	W I	190bl	4708.00	LuO	270	4719.84	Sm II
160	4681.92	Tm I	60	4693.95	Cr I	190	4708.04	Cr I	140	4719.94	La II
950	4681.92	Ti I	140	4694.091	Th II	140cw	4708.07	Pr II	400 s	4720.16	Ac II
450	4681.994	Cu II	450	4694.1	S I	150	4708.22	Mo I	400	4720.36	Br II
50	4682.03	Dy II	300	4694.28	Tc I	260	4708.29	Nb I	65 b	4720.86	LuO
100	4682.28	Ra II	700	4694.33	Gd I	11	4708.83	Ca III	19	4721.00	Rh I
260	4682.32	Y II	200	4694.360	Kr II	35	4708.85	Y I	40	4721.03	Ca II
50	4682.52	Tb I	10	4694.69	Au I	12	4708.862	Ne I	85	4721.22	Dy I
25 c	4682.79	Tb II	24	4695.15	Cr I	21	4708.88	Ir I	40	4721.255	Cl I
700 r	4682.92	Pm I	285	4695.4	S I	800	4708.94	Ba II	110	4721.46	Gd I
9	4683.02	Si III	270bl	4695.46	LuO	120	4709.34	Sc I	40	4721.51	V I
430	4683.33	Gd I	170	4695.49	Gd I	6	4709.37	Be I	20	4721.591	Ar II
260	4683.42	Zr I	100	4695.61	Cs II	1400	4709.48	Ru I	30	4721.76	Rn I
310	4683.45	Nd I	290	4695.77	Pr I	140	4709.52	Pr I	250	4722.06	Pm II
60	4683.57	Xe III	160	4696.2	S I	190	4709.71	Nd II	400	4722.15	Zn I
7	4683.80	Si III	100	4696.38	Te II	160	4709.72	Mn I	160	4722.23	Na II
35	4683.81	Yb II	190	4696.44	Nd I	200	4709.78	Gd I	3200	4722.28	Sr I
190	4684.02	Ru I	500 r	4696.80	Pm I	130	4709.84	Ho II	600 c	4722.52	Bi I
110	4684.04	Nd I	180	4696.81	Y I	10	4710.067	Ne I	65	4722.62	Ti I
420bl	4684.16	LuO	24	4696.94	Ti I	1900	4710.08	Zr I	230	4722.69	Er I
600	4684.25	Gd III	60	4697.06	Cr I	120	4710.19	Ti I	160	4722.72	U II
40	4684.27	Yb I	430	4697.42	Gd I	80	4710.56	V I	40	4722.86	V I
24	4684.45	V I	15	4697.44	Ba III	40	4711.26	Sb II	50	4723.10	Cr I
270	4684.61	Ce II	50	4698.29	Sc II	65	4711.39	Ho I	65	4723.17	Ti I
450 w	4684.8	In II	240 d	4698.46	Cr I	160	4711.92	Zr I	90	4723.438	Th I
9	4685.08	Sr IV		4698.62	Cr I	10	4712.066	Ne I	30	4723.60	Xe III
70	4685.11	Tm I	95	4698.68	Dy II	20	4712.841	Th I	110	4724.26	Tm I
320	4685.14	Nb I	190	4698.76	Ti I	270	4713.06	Sm II	190	4724.35	Nd II
20	4685.27	Ca I	120	4699.01	Hf I	30	4713.146	He I	50	4724.42	Cr I
6	4685.4	He II	220	4699.21	O II	4	4713.38	He I	110	4725.09	Ce II
30	4685.7	He II	8	4699.28	Ra I	150	4713.50	Nb I	300 w	4725.55	Pr III
10000	4685.70	Bk	120	4699.34	Sm II	30	4713.59	Eu I	60	4725.85	Y I
10	4685.829	Ge I	200	4699.51	Pm I	600 w	4713.70	Pr III	130	4726.02	Sm II
50	4686.195	Th I	2000 l	4699.70	Am II	200	4714.00	Ce II	190	4726.08	Yb II
23	4686.22	Ni I	20	4700.43	Ba I	65	4714.12	V I	65 h	4726.20	Lu I
200	4686.91	Te II	35	4700.61	Cr I	200	4714.22	Tc I	40	4726.44	Ba I
21	4686.92	Ti I	110	4701.15	Al III	110	4714.42	Ni I	550	4726.868	Ar II
35	4686.92	V I	50	4701.16	Mn I	100	4714.81	Ce II	300	4727.06	Pm I
370	4687.18	Sm II	70	4701.17	Ho II	40	4714.89	V III	70	4727.13	Dy II
180	4687.80	Pr I	150	4701.41	Al III	600	4715.06	Gd III	50	4727.15	Cr I
2300	4687.80	Zr I	80	4701.69	Ho II	130	4715.26	Sm II	180	4727.48	Mn I
140	4688.12	Gd I	500	4701.79	Cs II	24	4715.30	Ti I	40	4728.16	Tb II
130	4688.22	Mo I	15	4702.316	Ar I	15	4715.347	Ne I	300	4728.20	Br II
510	4688.45	Zr I	200	4702.41	Tb II	190	4715.59	Nd II	270	4728.21	Pr III
80	4688.63	Tb II	100	4702.51	U II	22	4715.78	Ni I	900 r	4728.36	Pm I
370	4688.73	Sm I	7	4702.99	Mg I	35	4715.89	V I	230	4728.42	La II
170	4689.07	U II	170	4703.13	Gd I	40 w	4716.07	Tb II	770	4728.42	Sm I
400	4689.36	Tc I	300	4703.14	Cl III	730	4716.10	Sm I	150	4728.47	Gd II
70	4689.37	Cr I	140	4703.28	La II	280	4716.2	S II	170	4728.53	Y I
50	4689.75	Dy II	130	4703.57	Nd II	11	4716.27	Ca III	400 r	4728.68	Pm I
85	4689.77	Y I	50	4703.990	Th I	170	4716.44	La II	35 c	4728.72	Ho II
75 h	4689.87	Ge II	15	4704.395	Ne I	10	4716.58	Ac I	200	4728.77	Sc I
50 h	4690.02	Ge II	530	4704.40	Sm II	16	4716.65	Si III	50	4728.86	Ir I
290	4690.11	Ru I	500	4704.85	Br II	30	4716.70	Lu I	150	4729.05	Er I
110	4690.35	Nd I	60 h	4705.3	Bi II	30	4716.74	Ca II	30	4729.128	Th I
24	4690.80	Ti I	285	4705.36	O II	270	4717.07	Sm I	100	4729.14	Mo I
120	4691.11	Tm I	130 c	4706.14	Nb I	130 c	4717.52	Ho I	490	4729.23	Sc I
100	4691.301	Kr II	55	4706.16	V I	120	4717.62	Zr I	40	4729.53	V I
190	4691.34	Ti I	100	4706.53	Te II	55	4717.69	V I	24	4729.72	Cr I
45	4691.523	Cl I	470	4706.54	Nd II	210	4717.72	Sm II	10	4730.03	Mg I
35	4691.62	Ba I	80	4706.57	V I	2000	4717.77	Tc I	30	4730.3	Bi II
130	4691.90	Ta I	1000 l	4706.80	Am I	220	4717.92	Mo I	27	4730.38	V I
230	4692.50	La II	1000	4706.92	Tc I	190	4718.33	Sm II	1000	4730.45	Rb II
30	4692.91	Sb III	140	4706.96	Nd I	240	4718.43	Cr I	7	4730.52	Si III
80	4693.11	Tb II	120	4706.97	Sc I	240	4719.02	Nd I	340	4730.67	As II
400	4693.17	Br II	640	4707.26	Mo I	500 c	4719.02	Tc I	180	4730.67	Pr I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
120	4730.71	Cr I	2200	4741.92	Sr I	500	4757.84	Ru I	230	4773.94	Ce II
500	4730.8	Se I	290	4742.04	Ho II	13	4757.96	Ir I	110	4774.15	Sm II
160	4731.10	Na II	22	4742.11	Ti I	310	4758.12	Ti I	50	4774.80	Dy I
55	4731.17	Ti I	300	4742.2	Se I	100	4758.433	Cu II	450 w	4775.30	Pr III
140	4731.33	Ru I	27	4742.63	V I	40	4758.44	Tb II	120 h	4775.79	Dy I
700	4731.44	Mo I	400	4742.64	Br II	320	4758.70	Gd I	30000	4775.95	Rb II
120	4731.59	U II	170	4742.79	Ti I	800 r	4759.00	Pm I	150	4776.34	Mo I
140	4731.77	Nd I	390	4743.09	La II	310	4759.28	Ti I	130	4776.36	V I
170	4731.84	Dy II	410	4743.65	Gd I	170	4759.65	Er II		4776.52	V I
21	4731.86	Ir I	1200	4743.81	Sc I	70	4759.90	Tm I	55	4777.48	Ho II
50	4732.053	Ar II	100	4744.16	Pr I		4760.	Li I	190	4777.85	Sm II
40 h	4732.30	Sc I	6	4744.35	K I	50	4760.04	Dy II	65	4778.16	Ir I
300	4732.33	Zr I	30	4744.69	Cd II	3	4760.17	Au II	65	4778.26	Ti I
60 h	4732.37	Y I	70	4745.11	Rh I	770	4760.19	Mo I	50	4778.294	Th I
100	4732.50	Na II	350 r	4745.13	Pm I	40	4760.19	Tb II	35	4778.36	Tb II
220	4732.60	Gd II	19	4745.31	Cr I	730	4760.27	Sm I	35	4778.80	Tb II
350	4732.98	Cs II	470	4745.68	Sm II	110	4760.74	Gd I	220	4779.35	Sc I
680	4733.34	Tm I	40	4745.73	Dy II	410	4760.98	Y I	400	4779.40	Br II
45	4733.43	Ti I	110	4745.82	Gd I	6	4761.12	Pb III	30	4779.42	Ho I
100	4733.52	Ce II	24	4746.63	V I	180	4761.53	Mn I	120	4779.46	Nd I
120	4733.52	Ru I	150	4746.92	Pr II	200	4762.36	Tc I	17	4780.18	Y I
110 c	4733.89	Nb I	300	4747.11	Pr III	30	4762.37	Tb II	4000	4780.31	Br I
590	4734.10	Sc I	160	4747.17	Ce II	750	4762.38	Mn I	15	4780.87	Sc III
600	4734.152	Xe I	22	4747.68	Ti I	35	4762.39	Ho II	120	4781.04	Y I
60cw	4734.20	Tb I	70	4747.80	Tb I	300	4762.435	Kr II	70 c	4781.19	Ho I
800 r	4734.27	Pm I	40	4748.52	V I	700 r	4762.57	Pm I	900 r	4781.29	Pm I
140	4734.38	F II	320	4748.73	La II	100	4762.72	Pr II	13000	4781.32	Cl II
18	4734.68	Ti I	35 c	4749.09	Ho II	190	4762.78	Zr I	45	4781.72	Ti I
100bl	4735.00	LuO	75bl	4749.11	LuO		4763.	Li II	170 h	4781.87	Yb I
60	4735.08	Sc	100	4749.13	Cs II	250	4763.31	I I	180	4781.92	Gd I
10000	4735.40	Pu I	500	4749.61	Tc I	35	4763.57	Ho II	160	4782.74	Hf I
300	4735.41	Br II	20	4749.7	Bi II	500	4763.62	Cs II	600	4782.79	Gd III
12	4735.44	Sb II	220 c	4749.70	Nb I	130	4763.82	Gd I	5000 c	4782.83	Rb II
15000	4735.56	Er III	100	4750.39	Mo I	15	4763.95	Ni I	65	4782.92	Ho I
260	4735.75	Gd I	150	4750.72	Sm I	40bl	4764.22	LuO	50	4782.991	Si I
300	4735.906	Ar II	35	4750.75	Tm II	50	4764.29	Cr I	580	4783.10	Sm I
200 c	4736.51	Tc I	45	4750.98	V I	25	4764.47	Tb II	2000	4783.12	Er III
250	4736.69	Pr I	35	4751.40	Ho I	800	4764.865	Ar II	110	4783.35	Pr II
30	4736.771	Fe I	130	4751.52	Er II	20	4765.36	Sb II	940	4783.42	Mn I
20	4737.05	Tl II	35	4751.56	V I	10000 l	4765.40	Bk	200	4783.92	Tc I
310	4737.28	Ce II	70	4752.08	Cr I	1000	4765.744	Kr II	30	4784.03	Sb II
140	4737.35	Cr I	2500	4752.28	Br I	300	4765.86	Mn I	70	4784.21	B II
2000 c	4737.62	Y III	140	4752.414	Th II	350	4766.00	Br II	1400	4784.32	Sr I
690	4737.65	Sc I	410cw	4752.53	Tb II	100	4766.05	Te II	300	4784.62	Gd I
200 r	4737.99	Pm I	1000	4752.72	Tc I	300	4766.07	Ce III	100	4784.87	Te II
35	4738.00	Ho II	10	4752.732	Ne I	45	4766.33	Ti I	210	4784.92	Zr I
400	4739.0	Se I	160	4752.79	Y I	500	4766.43	Mn I	1600	4785.19	Br I
3000	4739.002	Kr II	200	4753.16	Sc I	13	4766.600	Th I	150	4785.42	Lu II
100	4739.08	Pm II	5	4753.93	K I	22	4766.63	Cr I	500	4785.50	Br II
130	4739.11	Mn I	40	4753.93	V I	55	4766.63	V I	500	4785.60	Tc I
1400	4739.48	Zr I	1000	4754.04	Mn I	160	4766.89	La I	350	4785.86	Sm I
100	4739.53	Ce II	60	4754.99	Dy II	12	4766.91	Sb II	55 c	4786.29	Ho I
6	4739.59	Mg II	1000	4755.30	Rb II	470	4767.24	Gd I	200	4786.36	Cs II
350	4739.66	Cs II	12	4755.58	Rh I	30	4767.86	Cr I	5	4786.49	K I
5	4739.71	Mg II	100	4755.74	U II	4300	4768.65	Cl II	110	4786.51	V I
200	4739.78	Pm I	340	4756.11	Cr I	100	4768.77	Ce II	20	4786.531	Th I
80	4739.93	Tb I	26	4756.46	Ir I	160	4768.79	Na II	45	4786.54	Ni I
150	4740.16	Ta I	220	4756.51	Ta I	120	4768.98	Ta I	160	4786.58	Y II
500	4740.28	La II	30	4756.52	Ni I	28	4769.77	Ti I	170	4786.61	Yb II
27	4740.50	Eu I	150	4756.81	U I	110	4770.20	Sm I	110	4786.75	Gd I
190	4740.529	Th II	100 c	4757.01	Ho I	4000	4771.54	Tc I	180	4786.78	Tb I
10000	4740.61	Tc I	100 w	4757.3	Xe III	70	4771.56	Te II	170	4786.89	Y I
45	4740.729	Cl I	7	4757.39	K I	200	4771.75	C I	75	4786.92	Dy II
4	4740.91	K I	65	4757.48	V I	300 w	4771.83	Pr III	285	4788.13	N II
10	4740.95	Sc III	140	4757.54	W I	60	4771.94	Dy I	55 h	4788.18	Pd I
790	4741.02	Sc I	500 r	4757.73	Pm I	870	4772.31	Zr I		4788.36	Li II
85	4741.40	Y I	20	4757.81	Sb II	100	4772.70	U II	100	4788.40	Ag II
160	4741.67	Na II	400 c	4757.82	Rb II	700 r	4773.46	Pm I	160	4788.67	Zr I
1000	4741.806	Ge II	110	4757.84	Ce II	200	4773.89	Tc I	100	4788.79	Na II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
12	4788.927	Ne I	10	4807.14	Ir I	200	4824.06	La II	770	4839.87	Y I
190	4789.32	Cr I	220	4807.45	Gd I	50	4824.097	Ge II	100	4840.27	Co I
40	4789.387	Th I	27	4807.48	Tm I	280	4824.29	Zr I	25	4840.39	Tb I
170	4789.41	Nd II	130	4807.53	V I	85	4824.96	Dy I	40 h	4840.47	Eu I
40cw	4789.91	Tb II	50	4807.94	Dy I	300	4825.18	Kr II	40	4840.47	Sc I
27	4789.92	Tm II	45	4808.134	Th I	22	4825.46	Ti I	285	4840.6	Se II
160	4789.96	Sm I	45	4808.53	Ti I	350	4825.48	Nd II	10	4840.77	Ir I
10	4790.22	Ne I	35	4808.68	Tm I	100	4825.91	Ra I	50	4840.843	Th I
200 c	4790.48	Tc I	160	4809.01	La II	40	4826.700	Th I	470	4840.87	Ti I
7	4791.05	K I	4	4809.36	Pb V	1	4826.86	Pb III	100	4841.36	Tc I
95	4791.29	Dy I	100	4809.42	Tc I	27	4826.99	Tm II	970	4841.70	Sm I
190 c	4791.42	Re I	21	4809.47	Ir I	100	4827.14	Te II	75	4841.75	Dy I
35	4791.48	Ho II	140	4809.47	Zr I	100	4827.28	Sc I	21	4842.43	Rh I
90	4791.50	Sc I	700 r	4809.54	Pm I	10	4827.344	Ne I	30 c	4842.69	Tb II
230	4791.58	Sm II	29000	4810.06	Cl II	130	4827.45	V I	150	4842.90	Te II
250	4791.62	Tc I	40	4810.28	Dy I	400 r	4827.72	Pm I		4843.0	Li II
35	4792.212	Si I	23	4810.49	Rh I	190	4828.04	Zr I	300	4843.29	Xe I
80	4792.324	Si I	400	4810.53	Zn I	200	4828.16	Be II	800	4843.46	Ba II
110	4792.49	Ti I	22	4811.08	Ti I	75	4828.88	Dy I	790	4843.81	W I
95	4792.51	Cr I	240	4811.34	Nd II	18	4828.97	Si III	45	4843.99	Rh I
500	4792.58	Au I	100	4811.60	Au I	27	4828.97	Tm I	200	4844.01	Pm I
45	4792.59	Eu I	300	4811.76	Kr II	22 h	4829.03	Ni I	310	4844.21	Sm II
150	4792.619	Xe I	4800	4811.88	Sr I	9	4829.23	K II	25	4844.32	Mn I
110	4792.86	Co I	900 r	4811.96	Pm I	40 h	4829.30	Eu I	120	4844.56	Ru I
670	4793.99 '	Os I	300	4812.22	Ac II	110	4829.38	Cr I	350	4844.81	Br II
99000	4794.55	Cl II	40	4812.25	Ti I	130	4829.57	Sm II	30	4844.89	Tb II
250	4794.59	Pm I	220	4812.75	Ta I	50	4829.68	Dy II	360	4845.0	Se II
200	4795.43	Pm I	50	4812.80	Dy I	400	4829.71	Xe I	17	4845.38	Ir I
30	4795.67	Ir I	27	4812.92	Ho II	800	4830.16	Cs II	550	4845.68	Y I
35	4795.92	Ho II	400	4812.948	Cu II	60	4830.33	Eu I	700	4846.612	Kr II
20 h	4796.2	Ag I	15	4813.33	Si III	410	4830.51	Mo I	300	4847.14	Ba II
45	4796.22	Ti I	35	4813.50	Tm I	45	4831.121	Th I	180	4847.38	N I
100	4796.52	Mo I	100	4813.77	Tb I	10 d	4831.16	Co II	80	4847.68	Sc I
130	4796.92	V I	1000	4814.608	Ge II	19	4831.18	Ni I	140	4847.76	Sm II
50	4797.01	Hg III	50	4814.75	Na II	80	4831.20	Tm II	140	4847.77	Ce I
120	4797.15	Nd II	190	4815.04	Zr I	150	4831.28	Te II	150	4847.810	Ar II
40 h	4797.4	Bi III	85	4815.05	Lu I	300	4831.35	Tc I	30 h	4847.82	Ag I
35	4797.98	Ti I	450	4815.5	S II	150	4831.64	V I	110	4848.10	Gd I
4	4798.59	Pb III	260	4815.52	Ru I	800	4832.077	Kr II	270	4848.32	Sm I
45 h	4798.87	Ho I	700	4815.63	Zr I	3600	4832.08	Sr I	30	4848.362	Th I
700 r	4798.98	Pm I	430	4815.81	Sm II	130	4832.28	Nd II	110 c	4848.37	Nb I
180	4799.30	Y I	110	4816.38	Nb I	55	4832.31	Ho II	65	4848.47	Ti I
6	4799.75	K I	35	4816.43	Yb I	70	4832.38	Dy I	350	4848.75	Br II
19	4799.77	V I	500	4816.70	Br II	120	4832.43	V I	19	4848.81	V I
110	4799.80	Ti I	500	4816.79	Tc I	20	4832.82	Sb II	110	4849.06	Nd II
300	4799.912	Cd I	400 r	4817.12	Pm I	19	4833.02	V I	40	4849.16	Be I
40	4799.97	Ca II	85bl	4817.38	YO	30	4833.32	Ho I	60 h	4849.64	Eu I
300	4799.98	Tc I	45 h	4817.51	Pd I	100	4833.67	Sc I	7	4849.86	K I
8	4800.43	Si III	140bl	4818.20	YO	35	4833.75	Dy II	200	4850.84	Ba II
310	4800.50	Hf I	300	4818.46	Br II	1000	4834.37	Tc I	7	4851.10	Mg II
29	4800.64	Dy I	75	4819.04	Dy I	10	4834.93	Yb III	17	4851.15	Yb II
120	4801.03	Cr I	20	4819.193	Th I	130	4835.26	Gd I	120	4851.262	Cu II
140	4801.05	Gd II	410	4819.25	Mo I	50	4835.26	Na II	210	4851.36	Zr I
900 r	4801.36	Pm I	16000	4819.47	Cl II	1000	4835.39	Tc I	320	4851.48	V I
30	4801.87	Tb II	140	4819.64	Y I	35	4835.75	Tm I	60	4851.63	Rh I
20	4802.01	Sb II	16	4819.72	Si III	40	4836.13	Ti I	27 d	4851.76	Tm I
300	4802.33	Br II	40	4820.24	Yb II	14	4836.86	Cr I		4851.90	Tm II
450	4803.29	N II	140	4820.34	Nd II	500	4836.89	La IV	80	4852.68	Sc I
160	4804.04	La II	3000	4820.34	Pa	35	4836.96	Yb II	410	4852.69	Y I
50	4804.31	Y I	190	4820.35	Er II	40	4837.46	Yb I	350 r	4852.73	Pm I
8	4804.35	K I	200	4820.42	Ti I	60	4837.59	Tb II	15	4852.868	Th I
70	4804.81	Y I	10000	4820.74	Tc I	800 r	4837.66	Pm I	20000	4853.59	Tc I
28	4805.10	Ti II	320	4821.69	Gd I	10	4837.98	Eu III	120	4854.25	Y I
110	4805.43	Ti I	120	4822.13	Y I	110	4838.78	Zr I	120	4854.36	Sm II
100	4805.69	Tc I	110	4822.55	Ce I	400 r	4838.92	Pm I	30	4854.81	Tb I
260	4805.87	Zr I	26	4822.855	Th I	60	4839.15	Y I	890	4854.87	Y II
550	4806.020	Ar II	10	4822.96	Au I	170	4839.44	Sc I	300	4854.988	Cu II
22	4807.00	Ni I	190	4823.31	Y II	50 c	4839.62	Lu II	500	4855.04	Sr I
500	4807.02	Xe I	1000	4823.52	Mn I	300	4839.62	Pm I	2	4855.06	Pb III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
300 c	4855.34	Rb II	9	4869.76	K I	40	4886.65	Y I	100	4906.11	Y I
45	4855.41	Ni I	400 r	4869.80	Pm I	380	4886.90	W I	80	4906.67	Sc I
30	4855.54	Ho II	10	4869.85	Hg III	130	4887.01	Cr I	55	4906.99	Ho II
80	4855.72	Hg II	800	4870.02	Cs II	500 r	4887.02	Pm I	110	4906.99	Pr I
290	4856.01	Ti I	250	4870.14	Ti I	95	4888.08	Dy I	20 h	4906.99	Si II
10	4856.07	Ra I	200	4870.77	Tc I	20	4888.21	Ag I	90 d	4907.06	In II
8	4856.09	K I	140	4870.80	Cr I	19	4888.53	Cr I	150	4907.18	Eu I
40	4856.24	Dy II	21	4871.26	V I	340	4888.557	As II	20	4907.209	Th I
20	4856.54	Tb II	120	4871.317	Fe I	100	4888.70	Tc I	120	4907.89	Ru I
50	4856.70	Y I	120	4871.50	Gd I	70	4889.042	Ar II	12	4908.2	Bi II
150	4857.20	Kr II	150	4872.09	Er II	140	4889.10	Nd II	1000	4908.51	Tc I
100	4857.21	Tc I	60	4872.136	Fe I	2200cw	4889.14	Re I	45	4909.00	Y I
600	4857.39	Pr III	2000 l	4872.22	Am II	40	4889.33	Dy II	2000	4909.57	Tc I
140	4857.44	Er I	19	4872.28	Tm II	27 c	4889.67	Ho II	1000	4909.734	Cu II
140ld	4857.79	ScO	700 r	4872.42	Pm I	5	4889.91	Hg I	24	4909.74	Tm I
	4858.09	ScO	3000	4872.49	Sr I	75	4890.10	Dy II	90	4909.76	Sc I
2 h	4858.22	Be II	40	4872.917	Th I	220	4890.70	Nd II	630	4910.40	Sm I
40	4858.333	Th II	100	4873.304	Cu II	100	4890.754	Fe I	180	4911.40	Eu I
90	4858.82	N III	17	4873.44	Ni I	150 c	4890.88	Tc I	800	4911.62	Zn II
30	4858.87	Tb II	10	4874.00	Ti III	240	4891.07	Nd I	27	4912.36	Yb I
280	4859.02	Nd II	100	4874.10	Ag I	250	4891.492	Fe I	500	4913.02	Tc I
10	4859.17	Ca III	35	4875.43	Pd I	27	4891.60	V I	350	4913.25	Sm II
130	4859.24	Hf I	620	4875.48	V I	27	4891.64	Tm I	190	4913.41	Nd I
170	4859.39	F II	80	4875.57	Tb II	8000	4891.92	Tc I	320	4913.62	Ti I
10	4859.41	Ra II	40	4875.93	Dy I	1000	4891.98	Sr I	140	4914.02	Pr I
50	4859.741	Fe I	600	4876.06	Sr I	30	4892.35	Ho I	170	4914.37	Nd II
330	4859.84	Y I	8	4876.07	Er III	150	4892.49	Tc I	150 c	4914.70	Tc I
45	4860.39	Ho I	25	4876.12	Tb II	700 r	4892.52	Pm I	160	4914.94	N I
400 r	4860.62	Pm I	400	4876.24	Po I	95	4893.44	Y I	55	4915.24	Ti I
700 r	4860.74	Pm I	2000	4876.32	Sr I	50	4893.68	Dy I	95	4915.90	Tb I
320	4860.91	La II	2	4877.22	Sn II	21	4894.21	V I	10	4916.00	Mg III
100	4860.99	U II	20	4877.24	Sb II	29	4894.33	Tb	80	4916.068	Hg I
17	4861.20	Cr I	30 h	4877.65	Ba I	40 h	4894.60	Yb I	80	4916.07	Hg I
80	4861.33	H I	25	4878.13	Ca I	90	4894.68	Eu I	55	4916.41	Dy I
3000 s	4861.49	Pa	30	4878.208	Fe I	45	4894.955	Th I	500	4916.51	Xe I
70	4861.84	Cr I	3	4878.37	In I	285	4895.11	N II	10	4916.6	Bi II
100 c	4862.19	Tc I	26	4878.733	Th I	160	4895.60	Ru I	200	4916.94	I I
1000	4862.32	I I	27	4879.19	Tm I	35	4896.44	Ho II	10 h	4917.5	Ag I
110	4862.59	Gd I	12	4879.53	Pt I	81000	4896.77	Cl II	26000	4917.73	Cl II
35	4862.61	V I	50	4879.65	Y I	280	4896.93	Nd I	400 r	4918.28	Pm I
100	4863.00	Ga III	800	4879.864	Ar II	110	4898.76	Al II	22	4918.36	Ni I
280	4863.163	Th II	85	4880.16	Dy I	24	4899.24	Dy I	500	4918.376	Cu II
8	4863.48	K I	55	4880.56	V I	380	4899.91	Ti I	430	4918.99	Sm I
100	4863.75	Cl III	28	4880.91	Ti I	850	4899.92	La II	150	4918.992	Fe I
35	4864.18	Ti I	80	4881.15	Tb II	400	4899.97	Ba II	240	4919.816	Th II
200	4864.42	P II	110	4881.24	Zr I	210	4900.08	Er II	130	4919.87	Ti I
480	4864.74	V I	4	4881.32	Li II	1100	4900.12	Y II	110	4920.11	Ta I
170	4865.02	Gd II	4	4881.39	Li II	400	4900.30	Pm I	500	4920.502	Fe I
130	4865.12	Te II	1	4881.49	Li II	55	4900.62	V I	200 c	4920.67	Tc I
300 r	4865.30	Pm I	740	4881.56	V I	60	4900.86	Eu I	330	4920.68	Nd II
18	4865.36	Lu II	50	4881.72	Cd II	150	4901.427	Cu II	1000	4920.98	La II
110	4865.60	Os I	45	4882.35	Ti I	120	4901.53	Nd I	260	4921.07	Ru I
500 r	4865.72	Pm I	180	4882.46	Ce II	210	4901.84	Nd I	400	4921.12	Br II
50	4865.910	Ar II	5	4883.00	Hg I	110	4902.03	Nd II	100	4921.27	Ta I
160	4866.06	Zr I	15 h	4883.20	Si II	110	4902.77	Al II	180	4921.77	Ti I
200	4866.24	Te II	110	4883.60	Zr I	15	4902.90	Ba I	1000	4921.79	La II
30	4866.27	Ni I	1900	4883.69	Y II	470	4903.05	Ru I	150	4921.87	Y I
10000	4866.73	Tc I	210	4883.77	Sm I	35	4903.24	Cr I	20	4921.931	He I
190	4866.74	Nd I	350	4883.81	Nd I	30	4903.309	Fe I	50	4922.22	Dy II
200	4867.12	Po	730	4883.97	Sm I	110 h	4904.10	Al III	260	4922.27	Cr I
150	4867.15	N III	40 h	4884.05	Eu I	300 r	4904.28	Pm I	45	4922.73	Ho I
110	4867.62	Eu I	40	4884.55	Dy I	95 d	4904.29	V I	90	4922.84	Sc I
150	4867.88	Co I	10	4884.917	Ne I		4904.34	V I	500	4923.152	Xe I
360	4868.00	Mo I	400	4885.08	Ti I	40	4904.41	Ni I	65	4923.16	Dy II
40	4868.05	Dy II	80	4885.22	Te II	80	4904.44	Te II	300	4923.60	Tc I
200	4868.26	Ti I	1500 c	4885.59	Rb II	20	4904.752	Ar II	55	4923.83	Tm I
600	4868.70	Sr I	35	4885.78	Cr I	47000	4904.78	Cl II	220	4923.90	Re I
550	4869.15	Ru I	19	4885.96	Cr I	460	4904.88	Lu I	12	4923.92	Fe II
40	4869.5	Xe III	50	4886.28	Y I	170	4904.97	Sm I	500	4924.03	Zn II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
110	4924.04	Sm I	500	4943.53	P II	55	4964.75	Ti I	15	4981.35	Tl II
35	4924.09	Tb I	5	4943.88	C V	35	4964.93	Cr I	5800	4981.73	Ti I
360	4924.1	S II	3	4944.31	Sn II	10	4965.03	K I	120	4982.13	Y II
470	4924.53	Nd I	130	4944.36	Er I	200	4965.080	Ar II	220	4982.59	W I
160	4924.60	O II	5	4944.56	C V	30	4965.731	Th I	80	4983.45	Sc I
200	4924.60	Pr I	200 w	4944.56	N V	35	4965.88	Mn I	45	4984.13	Ni I
70 h	4924.93	In II	260	4944.83	Nd I	21	4966.04	Ti I	24	4985.372	Th I
450	4925.3	S II	100	4945.18	Ac II	23	4966.12	V I	500	4985.506	Cu II
55	4925.41	Ti I	300	4945.51	Br II	55cw	4966.73	Ho II	40	4985.52	Dy I
85	4925.65	V I	300	4945.59	Kr II	140	4966.90	Yb I	50 h	4985.65	V IV
110	4926.00	Ta I	110	4946.47	La II	250 c	4967.21	Ho II	370	4986.83	La II
30	4926.16	Ti I	27 c	4946.80	Ho I	130 c	4967.78	Nb I	1000	4986.92	I II
200	4926.424	Cu II	450	4946.81	Po	1300	4967.94	Sr I	285	4987.37	N II
35	4926.83	Tb I	8	4947.35	Ba I	65	4968.58	Ti I	300	4988.77	Xe II
150	4927.20	P II	15	4947.40	Sb II	160	4968.90	Ru I	35 c	4988.96	Ho I
150	4927.41	Cu III	1 h	4947.45	Si IV	12	4969.7	Bi II	190	4988.97	Nb I
10	4927.53	Ra II	60	4947.575	Th II	300	4969.71	P II	150	4989.15	Ti I
18	4927.780	Th I	30	4947.607	Si I	10 h	4970.05	Co II	55	4989.32	Tm II
150	4928.34	Ti I	400	4948.06	Tc I	5	4970.37	Hg I	10000	4989.34	Pu I
400	4928.79	Br II	45	4948.18	Ho II	340	4970.39	La II	250	4989.94	Nd II
50	4928.93	Tb I	21	4948.19	Ti I	26	4970.48	Ir I	10 h	4990.47	Co II
230 w	4930.27	O V	170	4948.63	Sm II	40	4970.87	Tm II	11	4990.50	Fe II
15 w	4930.53	V V	370	4949.77	La I	29	4970.99	Tb II	200 l	4990.79	Am I
450	4930.66	Br II	10	4950.10	Ti III	10	4971.19	Ti III	4600	4991.07	Ti I
35	4930.93	Y I	3	4950.11	Si IV	27	4971.26	Tm I	100 l	4991.17	Xe II
900	4931.698	Cu II	160	4950.23	N I	100	4971.40	Pm II	140	4991.28	La II
65	4931.79	Tb I	110	4950.62	Mo I	29	4971.42	Tb I	140	4991.92	Sc I
35	4932.03	V I	45	4950.66	Y I	130	4971.50	Ce II	500	4992.02	Ni II
200	4932.05	C I	30 h	4950.82	Au I	10	4971.64	Cl III	120	4992.74	Ru I
20 h	4932.80	Si II	9	4950.82	K I	8	4971.66	Li I	50	4992.89	Sc III
600 r	4932.99	Pm I	380	4951.37	Pr I	200 l	4971.71	Xe II	20 h	4992.89	Ag I
35	4933.209	Ar II	180	4951.74	Er II	8	4971.75	Li I	285	4993.5	S I
160	4933.26	F II	120	4952.37	Sm II	500	4972.59	Cs II	20	4993.6	Bi II
20000	4934.09	Ba II	110	4952.47	Gd I	400	4972.71	Xe II	150	4993.78	Ga III
210	4934.11	Er II	4	4952.52	Th IV	29	4973.04	Tb I	27	4993.79	Tm II
280	4934.12	Gd I	800	4952.84	Cs II	75	4973.05	Ti I	85	4993.82	Tb II
90	4934.25	Sc I	55	4953.52	Eu I	110	4973.14	Nb I	800	4994.13	Lu II
140	4934.83	La II	700	4953.724	Cu II	28	4973.57	Dy I	450	4994.36	N II
55 c	4934.89	Ho I	170	4954.06	Sc I	80	4973.57	Hg III	130	4994.63	Ce I
210	4935.12	N I	300	4954.39	P II	120	4973.66	Sc I	19	4994.72	Tm II
710	4935.50	Yb I	50	4954.659	Th II	150 c	4973.77	In II	100	4994.76	Zr I
45	4935.74	Sc I	290	4954.78	Nd I	120	4974.30	Y I	400	4995.00	Tc I
10	4935.75	Ag I	110	4954.81	Cr I	40	4975.12	Tm II	90	4995.05	Ho I
16	4935.83	Ni I	9	4956.15	K I	120	4975.25	Hf I	30	4995.08	Ti I
140	4936.00	Pr I	400	4956.43	Lu III	120	4975.35	Ti I	10000	4995.48	Cl II
110	4936.33	Cr I	1000	4957.15	Ba II	110	4975.75	Pr I	50	4995.84	Tb II
150	4936.42	Ta I	140	4957.18	Tm I	45	4975.76	Eu I	20 h	4995.98	Co II
2	4937.09	Th IV	480	4957.34	Dy II	35	4975.950	Th II	500 r	4997.10	Pm I
24	4937.22	Yb II	150	4957.54	Mo I	170	4975.98	Sm I	140	4997.10	Ti I
30	4937.74	Ti I	1500	4957.597	Fe I	5000	4976.34	Tc I	300	4997.81	Ba II
50	4938.09	Ir I	100	4958.23	Ac II	130	4976.42	Er I	55	4997.95	Tb I
120	4938.10	Sm II	21	4958.25	Ti I	500	4976.45	Ce III	720	4999.47	La II
95	4938.29	Ti I	130	4958.79	Gd I	250	4976.72	Gd III	4000	4999.51	Ti I
180	4938.43	Ru I	290	4959.13	Nd II	65	4977.74	Ti I	25	4999.74	Ir I
220	4938.61	Gd I	65 c	4959.42	Ho II	60	4977.75	Rh I	110	4999.91	Mo I
290	4939.01	Ho I	700 r	4959.46	Pm I	120	4978.20	Ti I	100 s	5000.21	Am I
40	4939.642	Th I	24	4959.59	Dy I	50	4978.90	Tm I	16 h	5000.34	Ni I
320	4939.74	Pr I	55	4960.21	Eu I	210	4979.12	Mo I	60	5000.82	Te II
160	4940.30	Pr I	6	4960.65	F I	40	4979.18	Rh I	85	5000.95	Nb I
110	4940.38	B II	100	4960.87	Ac II	20	4979.73	Sn I	230	5001.01	Ti I
70	4941.33	Sc I	35	4961.03	Ho II	4000	4979.76	Br I	35	5001.02	Tm I
30	4941.58	Ti I	150	4961.39	Nd II	220	4979.97	Ho I	800	5001.14	Lu I
8	4942.02	K I	60	4961.88	Te II	45	4980.16	Ni I	70	5001.48	Ca II
180	4942.34	Lu I	170	4961.94	Sm II	29	4980.16	Tb II	650	5001.48	N II
70	4942.50	Cr I	8000	4962.26	Sr I	160	4980.35	Ru I	27	5001.59	Tm I
120	4943.026	Cu II	55	4962.55	Eu I	150	4980.37	Sc I	80	5001.862	Fe I
220	4943.06	O II	60	4963.71	Rh I	29	4980.56	Tb I	18	5001.91	Fe II
6	4943.29	K II	350	4963.98	N I	5	4980.64	Hg I	140	5002.00	F II
110	4943.44	Ce I	80 h	4964.18	Co II	40	4980.68	Tm II	50	5002.097	Th I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
50	5002.097	Th I	20 h	5016.45	Kr III	55	5032.95	Ho II	100	5047.71	Mo I
65	5002.25	Nb I	26	5016.78	Mo I	50	5033.00	Dy I	10	5047.74	He I
70	5002.33	V I	10	5016.88	Ge III	50	5033.12	Tb I	40	5047.96	Nb I
200	5002.67	Tc I	70	5017.163	Ar II	100	5033.38	Pr I	26	5048.21	Ti I
360	5002.70	N II	260	5017.255	Th II	150	5033.52	Nd II	16	5048.85	Ni I
25	5002.74	Ir I	50	5017.59	Ni I	90	5033.55	Eu I	10	5049.55	Ba III
50	5003.87	Dy I	230	5017.75	Nb I	160	5034.22	Tm II	240	5049.796	Th II
11	5004.20	Fe II	27	5017.87	Tm II	270	5034.41	Pr II	30	5049.819	Fe I
55	5004.28	Dy II	24	5017.98	Dy II	100	5035.37	Ni I	10	5050.07	Ca III
19	5004.91	Mn I	95	5018.20	Hf I	12	5035.71	Fe II	50 h	5050.21	Dy I
870	5005.15	N II	80	5018.39	Sc I	1200	5035.91	Ti I	210	5050.57	La I
4	5005.159	Ne I	12	5018.43	Fe II	200	5035.94	Er I	65	5050.88	Gd II
1000	5005.416	Pb I	120	5018.59	Pr I	840	5036.47	Ti I	30	5051.44	Ho II
8	5005.60	K II	40	5019.51	Nb I	200	5037.37	Ta I	28	5051.63	V I
30	5005.711	Fe I	200	5019.76	Pr I	65 c	5037.60	Ho I	30	5051.634	Fe I
100	5005.74	Tc I	20	5019.85	Mo I	10	5037.751	Ne I	900	5051.793	Cu II
40	5006.061	Si I	80	5019.97	Ca II	120	5037.78	Ce II	17	5051.90	Cr I
29	5006.10	Tb II	840	5020.03	Ti I		5037.92	Li II	200	5052.17	C I
100	5006.117	Fe I	70	5020.14	Sc I	740	5038.40	Ti I	500	5052.70	Cs II
330	5006.15	W I	1000 l	5020.96	Am II	300	5038.74	Br II	200	5052.76	Sm II
100	5006.572	Pb I	40	5021.14	Ca II	23	5038.91	Mo I	110	5052.87	Ti I
400	5006.801	Cu II	350	5021.279	Cu II	200	5039.016	Cu II	820	5053.28	W I
100	5006.97	Y I	80	5021.51	Sc I	210	5039.04	Nb I	30	5053.35	Dy I
3600	5007.21	Ti I	15	5021.75	Hf I	75	5039.09	Gd I	160	5053.40	Pr I
250	5007.25	Er I	70	5022.12	Dy I	45	5039.12	Os I	21	5054.08	Ti I
550	5007.32	N II	50	5022.16	Tb I	24	5039.230	Th I	55	5054.30	Tb I
110	5008.21	U II	200	5022.40	Kr II	1200	5039.95	Ti I	210	5054.60	W I
10	5008.95	Ca III	120	5022.87	Ce II	35	5040.35	Ru I	300	5054.64	Br II
210	5009.10	Ce I	840	5022.87	Ti I	75	5040.62	Ti I	30	5054.92	Ho II
17	5009.17	Ir I	170	5022.91	Eu I	35	5040.74	Ru I	15	5054.94	Yb III
50	5009.334	Ar II	55	5023.13	Gd II	55	5040.82	Hf II	50	5055.00	Mo I
24	5009.52	Yb II	30	5024.03	Dy I	120	5040.85	Ce I	300	5055.27	Tc I
120	5009.65	Ti I	29	5024.24	Tb II	27 h	5041.00	Tm II	85	5055.347	Th II
160	5009.77	Tm II	24	5024.54	Dy I	1000	5041.03	Si II	24	5055.46	Dy I
350	5009.851	Cu II	29	5024.65	Tb I	23	5041.62	Ca I	1000	5055.98	Si II
24	5010.60	Dy I	580	5024.84	Ti I	150	5041.755	Fe I	7	5056.27	K II
450	5010.62	N II	50	5025.50	Cd II	210	5042.05	Er II	170	5056.46	La I
20	5010.81	Mo I	300	5025.58	Ti I	50 w	5042.06	Tb II	10000 s	5056.73	Bk I
65	5010.82	Gd II	360	5025.66	N II	130	5042.37	Ho I	450	5057.33	Ru I
160	5011.23	Ru I	90	5026.18	Ru I	50	5042.58	Pb II	55 h	5057.60	Lu I
30	5011.46	Zr I	500	5026.24	Tc I	160	5042.63	Dy I	170	5058.01	Nb I
55	5011.74	Gd I	150	5026.36	Nb I	22	5043.50	Tm I	35	5058.07	Mo I
100	5011.77	Ce II	65	5026.53	Ho I	85	5043.59	Ti I	300 r	5058.31	Pm I
60	5012.067	Fe I	300	5026.79	Tc I	800	5043.80	Cs II	60	5058.33	Tc I
35 c	5012.42	Ho I	200	5026.96	Pr I	110	5043.83	Pr I	40	5058.56	Re I
18	5012.46	Ni I	80	5027.35	Ag II	130	5043.86	Er I	70	5058.562	Th II
150	5012.54	F III	170	5027.38	U I	180	5044.02	Ce II	400	5058.910	Cu II
400	5012.620	Cu II	40	5027.87	Dy I	14	5044.04	Pt I	65	5059.35	Nb I
1000	5013.00	Ba II	150	5027.89	Tc I	35	5044.27	Ti I	30	5059.48	Pt I
180	5013.17	Eu I	65	5028.16	Ru I	400	5044.28	Sm I	500	5059.87	Cs II
40	5013.27	Nb I	30	5028.17	Ho I	15	5044.56	Sb II	200	5059.88	Mo I
55	5013.28	Ho II	200	5028.280	Xe I	300 s	5044.66	Np I	85	5060.39	Zr I
230	5013.30	Ti I	140	5028.33	Er I	50	5044.719	Th I	27	5060.42	Tm II
60	5013.32	Cr I	140	5028.44	Sm II	35	5044.73	Ho I	500	5060.69	Tc I
3200 d	5014.19	Ti I	120	5028.91	Er II	130	5044.89	Er I	35 c	5060.75	Ho I
	5014.24	Ti I	80	5029.00	Mo I	200	5044.92	Xe II	150	5060.90	Tm I
200 c	5014.52	Tc I	110	5029.54	Eu I	550	5045.10	N II	70	5062.037	Ar II
35	5014.56	Tm II	20	5029.892	Th I	55	5045.41	Ti I	110	5062.11	Ti I
180	5014.60	Mo I	40	5030.13	Nb I	35	5045.41	Tm I	27	5062.25	Tm I
85	5014.62	V I	11	5030.64	Fe II	320	5045.52	Pr I	35	5062.52	Mo I
30	5014.941	Fe I	25	5030.77	Fe I	17	5046.06	Ir I	21	5062.64	Ru I
90	5014.95	Ru I	65	5030.78	Mo I	10	5046.12	Lu III	110	5063.73	Nd II
30	5014.98	Ir I	200 r	5030.80	Pm I	26	5046.52	Mo I	35	5064.07	Ti I
750	5015.04	Gd I	530	5031.02	Sc II	250	5046.58	Zr I	35	5064.12	V I
220	5015.30	W I	65	5031.29	Gd II	140	5046.88	La I	250	5064.32	Sc I
100	5015.678	He I	55	5031.83	Os I	24	5047.25	Dy I	30	5064.59	Au I
50	5015.889	Th II	60	5032.09	Sc III	65	5047.31	Ru I	29	5064.64	Mo I
580	5016.17	Ti I	80	5032.45	Tc I	300	5047.348	Cu II	1400	5064.66	Ti I
360	5016.39	N II	55	5032.74	Sc I	95	5047.45	Hf I	360	5064.91	Zr I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
3	5065.12	Pb III	750	5078.96	Nb I	40 c	5094.41	Nb I	80	5110.32	Dy I
110	5065.22	Zr I	35	5079.09	Os I	400 r	5094.83	Pm I	150	5110.357	Fe I
130	5065.25	Nb I	200	5079.20	Mn III		5095.	Li	360	5110.38	Pr II
400 c	5065.37	I II	45 h	5079.3	Bi III	420	5095.30	Nb I	30	5110.75	Cr I
500	5065.459	Cu II	30	5079.65	Hf II	40	5095.89	Mo I	560	5110.76	Pr II
55	5065.79	Tb I	470	5079.68	Ce II	65	5096.06	Gd II	55	5110.81	Os I
27	5065.88	Tm I	35	5079.87	Mo I	200	5096.18	Pm I	55	5110.81	Pd I
17	5065.91	Cr I	100	5080.02	Mo I	5000	5096.28	Tc I	50	5110.867	Th II
95	5065.99	Ti I	24	5080.05	Tb II	90 h	5096.44	Eu I	160	5110.99	F III
80	5066.67	Tm I	100	5080.52	Ni I	70	5096.50	Re I	9	5111.07	Fe III
450	5067.094	Cu II	150	5080.52	Pm II	400	5096.60	Cs II	10	5111.64	Pb II
17	5067.30	Yb II	1000	5080.62	Xe II	100	5096.65	Mo I	15	5112.13	Hf I
100	5067.35	Pm II	65	5081.11	Ni I	390	5096.73	Sc I	12	5112.25	K I
40	5067.71	Cr I	24	5081.11	Tb I	11	5097.17	K I	50	5112.27	Zr II
30	5067.80	Yb I	35	5081.26	Mo I	150	5097.30	Pm II	130	5112.70	Ce I
100	5067.87	Ta I	30	5081.446	Th I	130	5097.52	Mo I	150	5112.86	Sc I
75	5067.95	Eu I	2100	5081.56	Sc I	10	5097.54	Ba III	17	5113.13	Cr I
110	5067.974	Th I	100	5081.77	Cs II	10	5097.56	Ra I	190	5113.44	Ti I
35 h	5068.33	Ti I	55	5082.80	Gd I	35	5098.03	Mo I	7 h	5113.76	Si III
7	5068.66	Zn I	8	5083.0	Te I	50	5098.043	Th II	95	5113.97	Tm I
80	5068.86	Sc I	1200	5083.72	Sc I	130	5098.38	Gd II		5114.	Li
100	5068.98	As I	10	5083.80	Ti III	11	5099.20	K I	8 h	5114.12	Si III
210	5069.12	W I	26 h	5084.08	Ni I	620	5099.23	Sc I	170	5114.37	Eu I
70	5069.14	Yb I	10	5084.23	K I	18	5099.32	Ni I	50	5114.55	Tm II
65	5069.35	Ti I	35	5085.09	Tm I	30	5099.789	Cl I	470	5114.56	La II
170	5069.46	Sm II	85	5085.26	Zr I	26 h	5099.95	Ni I	80	5114.97	Mo I
15	5069.58	Zn I	40	5085.34	Ti I	150	5100.03	Mn III	30	5115.044	Th I
75	5070.21	Y I	14	5085.52	Rh I	350	5100.067	Cu II	100 w	5115.14	In II
530	5070.23	Sc I	1100	5085.55	Sc I	170	5100.16	Nb I	140	5115.24	Zr I
100	5070.26	Zr I	1000 h	5085.822	Cd I	170	5100.22	Sm II	21	5115.40	Ni I
10	5070.58	Pb II	250	5086.52	Kr II		5100.39	Sm I	110	5115.84	Ta I
95	5070.68	Dy I	750	5086.95	Sc I	18	5100.73	Fe II	320	5116.69	Sc I
30	5071.09	Sr III	4	5086.99	Tl III	400 r	5100.77	Pm I	140	5116.70	Sm II
2	5071.14	Sn II	130	5087.07	Ti I	55	5100.94	Gd II	35	5116.97	Mo I
540	5071.20	Sm I	180	5087.12	Pr I	15	5100.95	Fe II	75	5117.02	Pd I
130	5071.48	Ti I	390	5087.14	Sc I	24	5101.09	Tb I	100	5117.03	Mn III
120	5071.74	W I	1100	5087.42	Y II	370	5101.12	Sc I	510	5117.16	Sm I
120	5071.78	Ce I	80	5087.75	Be I	40	5101.130	Th I	160	5117.17	Ce II
75	5072.19	Y I	2	5087.987	Rb I	12 p	5102.25	Ba III	70	5117.24	U II
350	5072.302	Cu II	30	5088.18	Y I	180	5102.39	Nd II	140 c	5117.40	In II
27	5072.42	Tm I	450	5088.277	Cu II	20	5102.70	Hg I	60	5117.94	Mn I
2	5072.67	Sn II	75	5089.12	Tb II	7500	5102.88	Y III	10000 l	5118.24	Bk I
35	5072.88	Os I	150	5089.35	Pm II	260	5103.09	Sm II	35	5118.39	Tb I
40	5072.92	Cr I	50	5089.484	Pb I	21	5103.15	Ti I	210	5119.11	Y II
90	5072.97	Ru I	24	5089.66	Tb I	200 c	5103.24	Tc I	10000	5119.29	I I
55	5073.74	Gd I	150 h	5089.84	Nd II	910	5103.45	Gd I	130 h	5120.04	Dy I
75	5073.98	Zr I	270	5089.89	Sc I	90	5103.50	Os I	24	5120.18	Tb I
65	5074.34	Ho I	20	5090.01	Pb I	500	5104.32	Tc I	170	5120.30	Nb I
220	5074.34	Yb I	50	5090.051	Th I	140	5104.48	Sm II	20	5120.32	Re I
10	5074.53	Pb II	80	5090.38	Dy II	35	5105.14	V I	1300	5120.40	Y III
55 b	5074.74	HfO	20	5090.495	Ar II	150 d	5105.21	Nd II	270	5120.42	Ti I
25	5074.748	Fe I	70	5090.63	Rh I		5105.35	Nd I	50	5120.42	Zr I
35	5074.77	Os I	80	5090.74	Tc I	1500	5105.54	Cu I	100	5120.60	Tc I
30	5074.79	Mn I	40	5090.97	Mo I	340	5105.58	As II	40	5120.64	Hg I
240	5075.35	Ce II	35	5091.34	Mo I	200	5106.23	La I	22	5120.67	Tm I
250	5075.81	Sc I	10 h	5091.42	Si III	80	5107.07	Ru I	23	5120.69	Rh I
120	5076.32	Ru I	10	5091.6	Bi II	10	5107.242	Pb I	270 c	5120.80	In II
10	5076.35	Pb I	5000	5091.70	Gd III	70	5107.52	Al I	100	5121.34	As I
27	5076.36	Tm I	35	5092.16	Mo I	40	5107.53	Tm I	250	5121.47	Pm II
360	5076.59	Nd II	95	5092.25	Gd II	500	5107.55	As II	200 w	5121.75	In II
50	5076.74	Yb I	200	5092.42	Pm I	360	5107.59	Nd II	85	5121.80	Nb I
27	5077.18	Tm I	45	5092.46	Sc I	24	5108.56	Tb I	350	5122.14	Sm I
40	5077.40	Nb I	75 h	5092.69	Eu I	30 h	5108.84	Au I	22	5122.23	Os I
130	5077.59	Er II	360	5092.80	Nd II	180	5108.91	Gd II	300	5122.42	Xe II
120	5077.67	Dy I	80	5093.07	Ho I	180	5109.06	Sc I	470	5122.99	La II
110	5078.25	Tb I	420	5093.816	Cu II	80 h	5109.36	In II	450	5123.21	Y II
470	5078.25	Zr I	200	5093.83	Ru I	55	5109.44	Ti I	17	5123.46	Cr I
26000	5078.26	Cl II	55 b	5093.88	HfO	130	5109.71	Mo I	15 h	5123.50	Ag I
25	5078.54	Tl II	400	5094.28	Cu III	200	5109.81	Tc I	30	5123.66	Ir I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
24	5123.73	Ru I	100	5139.462	Fe I	210	5152.20	Ti I	80	5166.281	Fe I
340	5123.79	Nd II	25	5139.53	V I	100 c	5152.30	Pr II	12	5166.32	Sb II
29	5123.83	Mo I	190	5139.60	Dy II	75	5152.63	Nb I	210	5166.70	Eu I
300	5124.06	Gd III	50	5139.65	Cr I	55	5153.20	Ru I	21bl	5166.86	TiO
50 h	5124.3	Bi II	100	5139.81	Pr I	2000	5153.24	Cu I	75	5167.33	Mg I
250	5124.476	Cu II	22	5140.28	Tm II	400	5153.86	Pm II	55	5167.42	Hf I
120	5124.56	Er I	75	5140.58	Nb I	50	5154.243	Th I	2500	5167.487	Fe I
90	5124.77	Eu I	85	5140.84	Gd II	6	5154.660	Cd I	100	5167.76	Mo I
120	5125.56	Gd II	50 w	5141.08	Tb II	360	5155.03	Sm II	90 c	5167.88	Ho I
100	5125.70	Xe II	75	5141.50	Gd I	500	5155.14	Ru I	16	5168.66	Ni I
400 h	5125.73	Kr II	100	5141.62	Ta I	300	5155.45	Zr I	80	5168.897	Fe I
10	5125.950	Th I	100	5141.63	As I	60	5155.54	Rh I	20	5168.922	Th I
55	5127.26	Ru I	100	5141.783	Ar II	40 h	5155.76	Ni I	200	5168.97	Cu III
400 r	5127.34	Pm I	130	5142.59	Ho II	860	5155.84	Gd I	28	5168.98	Os I
9	5127.35	Fe III	75	5142.68	Gd I	800 h	5156.07	Sr I	12	5169.03	Fe II
130	5127.41	Er II	170	5142.76	Ru I	12	5156.12	Fe III	1	5169.65	Rb I
85	5127.66	Nb I	23 h	5142.77	Ni I	330	5156.56	Ta I	110	5169.69	Dy II
140	5127.81	Ho I	60	5143.11	Na II	110	5156.72	P V	300	5169.71	Pm II
100	5128.45	Hg II	110	5143.22	Ho II	180	5156.74	La II	23	5169.94	V I
19	5128.53	Hf II	95	5143.267	Th II	55	5156.76	Gd II	130bl	5170.11	LuO
110	5128.53	V I	350	5143.49	C II	14	5157.09	Rh I	29	5170.13	Tb I
170	5129.10	Eu I	100	5143.69	Ta I	180	5157.43	La II	75	5170.18	Hf I
30	5129.15	Ti II	60 h	5144.3	Bi II	30	5157.96	Hf I	10000	5170.61	Bk I
55	5129.27	Ho II	11	5144.36	Fe II	200	5158.00	Zr I	24	5170.61	Tb I
18 h	5129.38	Ni I	14	5144.67	Cr I	100	5158.093	Cu II	920	5171.03	Ru I
410	5129.52	Pr II	10	5144.938	Ne I	35	5158.26	Sr III	45 b	5171.06	ScO
170	5129.57	Ce I	400 r	5145.13	Pm I	8	5158.41	La III	160 d	5171.08	Mo I
200	5129.75	Pm I	570	5145.16	C II	75	5158.48	Gd I		5171.25	Mo I
80 d	5129.85	In II	70	5145.308	Ar II	85	5158.604	Th I	500	5171.58	Pm II
90	5130.08	Eu I	150	5145.38	Mo I	35	5158.67	Zr I	500	5171.595	Fe I
65	5130.28	Gd II	450	5145.42	La I	290	5158.69	La I	220	5172.68	Mg I
30	5130.34	Sr III	270	5145.47	Ti I	40	5158.69	Rh I	250	5172.74	Sm I
680	5130.60	Nd II	22	5145.54	Os I	40	5159.35	V I	130	5172.78	Er I
19	5130.76	Rh I	5	5145.73	La III	280	5159.69	Ce I	20	5172.90	Dy II
50 h	5130.78	V IV	150 c	5145.86	Lu III	20 h	5159.94	Ba I	230 h	5172.94	Mo I
120	5131.53	Er I	500 r	5146.30	Pm I	55	5160.00	Ru I	150	5173.25	F II
50 w	5131.69	Tb I	40 h	5146.48	Ni I	270	5160.07	Eu I	1100	5173.75	Ti I
100	5131.752	Ge II	35	5146.74	Co I	80	5160.32	U II	620	5173.90	Pr II
170	5132.33	Nd II	14	5147.02	Yb II	250	5160.33	Nb I	10000	5173.96	Cf I
2	5132.471	Rb I	250	5147.24	Ru I	70	5160.730	Th I	160 h	5174.18	Mo I
350	5132.94	C II	14	5147.31	Ti III	75	5160.99	Zr I	20	5174.54	Sn I
350	5133.28	C II	110	5147.39	Mo I	40	5161.03	Dy II	190	5174.55	Ce I
40	5133.34	Nb I	100	5147.44	Au I	3000 c	5161.20	I II	2000	5174.81	Tc I
85	5133.40	Zr I	230	5147.48	Ti I	280	5161.48	Ce I	240 c	5175.42	In II
270	5133.44	Pr I	75	5147.54	Nb I	25	5161.65	Re I	470	5175.42	Sm I
210	5133.52	Eu I	110	5147.57	Ce II	200	5161.74	Pr II	150	5175.87	Br III
70 b	5133.68	ScO	50	5147.58	Tb I	2000	5161.81	Tc I	60	5175.97	Rh I
40	5133.69	Fe I	120	5148.211	Th II	30	5162.27	Fe I	300	5176.19	I II
130	5133.83	Er II	7	5148.7	Te I	15	5162.285	Ar I	190	5176.28	Gd II
65	5133.89	Ru I	70	5148.72	V I	80	5163.19	Mo I	50	5176.51	Tb I
140	5134.05	Lu I	40	5149.40	Tm II	120	5163.62	La II	15	5176.55	Sb II
10	5134.54	Ba III	12	5149.46	Fe II	75	5163.70	Gd I	13	5176.56	Ni I
20	5134.746	Th I	160	5149.59	Ho II	160	5163.84	Pd I	70	5176.77	V I
18	5134.75	Ge III	200	5149.73	I II	110 h	5163.89	Al III	50	5176.961	Th I
210	5134.75	Nb I	140	5149.74	Os I	40	5164.12	Dy II	12	5177.27	Rh I
30	5135.02	Dy I	100	5149.99	Ce I	55	5164.14	U I	580	5177.31	La I
2700	5135.09	Lu I	10	5150.134	Rb I	24	5164.27	Tb I	35	5177.43	Cr I
270	5135.14	Pr II	500	5150.63	Tc I	400	5164.38	Br II	20	5177.95	Ir I
180	5135.20	Y I	40	5150.64	Nb I	250	5164.38	Nb I	200	5178.648	Ge II
10000 s	5135.53	Bk II	50	5150.89	Mn I	55	5164.54	Gd II	100	5178.82	Xe II
65	5135.59	Gd I	110 h	5151.01	Al III	300	5164.58	Rb II	40 c	5178.89	Re I
20	5135.98	Yb II	110	5151.07	Ru I	170	5164.77	Er II	17	5178.99	Zr I
75	5136.04	Gd I	400	5151.09	C II	1	5165.023	Rb I	10000	5179.08	Cf I
530	5136.55	Ru I	5	5151.391	Ar I	170	5165.14	Nd II	50	5179.97	Tb I
23	5137.08	Ni I	50	5151.612	Th I	2	5165.142	Rb I	300	5180.01	Br II
20	5137.94	Hg I	25	5151.910	Fe I	50	5165.34	Dy I	230	5180.31	Nb I
110	5138.42	V I	28	5152.01	Os I	25	5165.773	Ar II	130	5181.17	Nd II
40	5139.251	Fe I	10000	5152.08	Rb II	85	5165.96	Zr I	20	5181.74	Re I
500	5139.26	Tc I	25	5152.14	Tl II	70	5166.23	Cr I	230	5181.86	Hf I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
100	5181.90	Si II	40	5193.52	Os I	75	5207.87	Ti I	75	5220.30	Gd II
6	5181.95	Tl II	23	5193.62	V I	150	5207.90	Pr II	7	5221.271	Ar I
200	5181.98	Zn I	60	5193.74	Eu I	40	5207.97	Tb I	23000	5221.36	Cl II
130 c	5182.11	Ho I	300	5193.90	Br II	500	5208.09	Pm II	45	5221.54	Ho I
500	5182.35	Br II	85 h	5194.04	Ti I	500	5208.32	Kr II	30	5221.75	Cr I
120	5182.60	Nd II	300	5194.05	Pm II	400	5208.34	Cu III	40	5221.99	Tb I
19	5182.68	Tm I	120	5194.43	Pr I	65	5208.42	Ti	1400	5222.20	Sr I
6	5183.10	Tl II	3	5194.583	Ge I	11000	5208.44	Cr I	19	5222.66	Rh I
100	5183.367	Cu II	110	5194.83	V I	150	5208.51	Pr III	95	5222.69	Ti I
850	5183.42	La II	200	5194.941	Fe I	80	5208.55	Na II	260	5223.46	Ce I
400	5183.61	Mg I	180	5195.02	Ru I	1000	5209.08	Ag I	300	5223.49	Eu I
100	5183.70	Zr I	150	5195.11	Pr II	75 h	5209.2	Bi II	65	5223.55	Ru I
35	5183.990	Th II	18	5195.23	Ho I	85	5209.30	Zr I	85	5223.64	Ti I
20	5184.15	Yb II	15	5195.278	Rb I	1400	5210.39	Ti I	250	5224.32	Ti I
35	5184.19	Rh I	200	5195.31	Pr II	26	5210.44	Mo I	95	5224.56	Ti I
140 c	5184.44	In II	55	5195.36	V I	55	5210.49	Gd II	770	5224.66	W I
55	5184.57	,U II	50 h	5195.814	Th I	390	5210.52	Sc I	85	5224.93	Zr I
70	5184.59	Cr I	150	5195.84	Nb I	30	5210.82	Hg III	85	5224.94	Cr I
50	5184.59	Tb I	60	5196.08	Yb I	50	5211.230	Th I	190	5224.95	Ti I
100 h	5185.25	Si II	120	5196.43	Y II	45	5211.28	Sc I	130	5225.05	Nd II
40	5185.25	Tm I	85	5196.44	Cr I	16	5211.52	Rh I	2000	5225.11	Sr I
80	5185.30	Dy I	50	5196.59	Mn I	85	5211.60	Yb I	250	5225.12	Pm II
85	5186.13	Tb I	170	5196.61	Lu I	720	5211.86	La I	65	5225.16	Nb I
40	5186.34	Ti I	5	5197.26	Si III	50	5211.86	Mo I	200	5225.55	Tc I
30	5186.84	Hf I	10000	5197.55	Bk I	190	5211.92	Ce I	35	5225.77	V I
110	5186.98	Nb I	95	5197.66	Dy II	65	5212.29	Ti I	12 d	5226.28	Ti III
30	5187.03	Zr I	410	5197.77	Gd I	310	5212.37	Nd II	65	5226.56	Ti II
55	5187.24	Gd II	50	5198.800	Th I	10000	5212.53	Bk I	60	5226.862	Fe I
370	5187.46	Ce II	50	5198.86	Tb I	50	5212.71	Co I	12	5226.89	Cr I
20	5187.746	Ar I	10	5199.08	Fe III	19	5212.73	Rh I	1500	5227.00	Cs II
30	5187.75	Hf II	95	5199.164	Th I	110	5212.74	Ta I	1000	5227.150	Fe I
55	5187.85	Ho I	200	5199.85	Eu I	60	5212.91	Er II	13	5227.49	Fe II
55	5187.88	Gd I	80	5199.87	Ru I	150	5213.23	Nd I	450	5227.5	Se II
300	5188.04	Xe II	330	5200.12	Nd II	80	5213.38	Tm I	35	5227.66	Pt I
260	5188.22	La II	110	5200.17	Mo I	45	5213.43	Ru I	110	5227.97	Pr I
40	5188.45	Dy II	35	5200.19	Cr I	19	5214.13	Cr I	120	5228.12	Tb I
50	5188.48	Tb I	960	5200.41	Y II	40	5214.28	Tb I	22	5228.23	Tm II
85	5188.70	Ti II	250	5200.59	Sm I	16	5214.79	Rh I	130	5228.43	Nd II
25	5188.85	Ca I	50	5200.74	Mo I	750	5215.10	Eu I	500 d	5228.97	I II
160	5188.90	Er II	110	5200.96	Eu I	30	5215.13	Er II	2000	5229.27	Sr I
190	5189.20	Nb I	65	5201.10	Ti I	25	5215.179	Fe I	45	5229.34	Er II
30	5189.58	Ti I	100	5201.15	Zr I	150	5215.96	Pm II	5	5229.37	Ge III
	5190.	Li	2000	5201.437	Pb I	200 l	5215.99	Am II	180	5229.75	Ce I
90	5190.11	Ho II	20	5201.5	Bi II	600	5216.27	I II	50	5230.22	Co I
50	5190.871	Th II	45	5202.12	Ru I	150	5216.274	Fe I	300	5230.26	Au I
55	5191.08	Gd II	500 h	5202.41	Si II	40	5216.59	V I	15	5230.41	F I
200	5191.32	Pr II	270	5202.63	Os I	95	5216.596	Th II	19	5230.62	Rh I
400	5191.37	Xe II	35 w	5202.77	Tb I	20	5216.814	Ar II	65	5231.06	Mo I
150	5191.41	P II	65	5203.22	Nb I	18	5216.85	Fe II	110	5231.160	Th I
40	5191.44	Mo I	35	5203.23	Os I	85	5217.48	Gd I	425	5231.38	As II
500	5191.45	Nd II	50	5203.33	Na II	56000	5217.94	Cl II	10	5231.82	Ca III
50	5191.454	Fe I	170	5204.15	La II	8	5218.12	Be II	26	5232.36	Mo I
4	5191.56	Pb III	45	5204.31	U II	2500	5218.20	Cu I	150	5232.81	Nb I
100	5191.60	Zr II	14	5204.51	Tm II	3	5218.21	Ga II	140	5232.92	Ce II
100	5191.65	Na II	5300	5204.52	Cr I	30	5218.26	Er II	250	5232.939	Fe I
210	5191.66	Ce II	40	5204.55	Tb I	20	5218.33	Be II	85	5233.225	Th II
70	5192.00	Cr I	30	5204.582	Fe I	110 d	5218.45	Ta I	85	5233.229	Th II
20	5192.01	V I	35	5205.13	Nb I	50	5218.528	Th II	35	5233.75	V I
100	5192.10	Xe II	1500	5205.72	Y II		5218.66	Ta I	130	5233.93	Gd I
80	5192.343	Fe I	10	5205.93	Ra I	360	5219.05	Pr II	2	5233.968	Rb I
630	5192.62	Nd II	8400	5206.04	Cr I	85 c	5219.10	Nb I	110	5234.07	V I
290	5192.86	Dy II	120	5206.08	Ti I	35	5219.110	Th I	450	5234.20	Nd II
200 h	5192.86	Si II	120	5206.44	Eu I	600	5219.21	Cu III	100	5234.26	Mo I
1300	5192.98	Ti I	90	5206.47	Lu I	10000	5219.24	Cf I	520	5234.27	La I
110	5192.99	V I	150	5206.52	Er I	280	5219.40	Gd I	35	5234.31	Re I
170	5193.08	Nb I	360	5206.55	Pr II	80	5219.40	Mo I	1000	5234.57	I I
95	5193.14	Rh I	100	5206.56	Tc I	280	5219.67	Sc I	55	5234.86	Pd I
8 h	5193.21	Ac III	20	5206.61	V I	150	5219.71	Ti I	40	5235.11	Tb I
12	5193.49	Cr I	16	5206.95	Rh I	560	5220.11	Pr II	45	5235.21	Co I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
150	5235.499	P IV	75	5253.03	Nb I	30	5265.16	Cr I	15	5276.48	Fe III
10	5235.66	Fe III	340	5253.46	La I	24	5265.56	Ca I	100	5276.525	Cu II
500	5236.26	Pm II	300	5253.52	P II	130	5265.71	Ce II	150	5276.88	Nd II
300	5236.66	Pm II	85	5253.93	Nb I	180	5265.72	Cr I	150 h	5277.04	Yb I
45	5237.16	Rh I	30	5254.32	In I	6	5265.892	Ge I	120	5277.41	Zr I
85 c	5237.43	Nb I	85	5254.75	Gd I	150	5265.98	Ti I	70	5277.501	Th II
9	5237.80	Rh I	60	5254.92	Cr I	26	5266.30	Co I	55	5277.71	Er I
10000	5238.10	Y III	60	5255.13	Cr I	200	5266.40	Eu I	17	5278.12	Ti III
460 h	5238.20	Mo I	85	5255.32	Mn I	40	5266.47	Ru I	100	5278.24	Re I
500	5238.23	Br II	360	5255.51	Nd II	45	5266.49	Co I	10	5278.70	Ti III
2800	5238.55	Sr I	10	5255.573	Th I	100	5266.555	Fe I	10000 s	5279.01	Cf
120	5238.58	Ti I	140	5255.80	Gd I	12	5266.710	Th I	12	5279.01	F I
22	5238.92	Ir I	45	5255.82	Os I	40	5266.83	Ru I	27	5279.34	Er II
20	5238.94	Sb II	75	5255.83	Ti I	20	5267.03	Ba I	29 c	5279.43	Nb I
19	5238.97	Cr I	3	5255.86	Be II	65	5267.11	Dy I	35	5279.53	Yb II
60	5239.0	Xe III	140	5255.93	Er II	24	5267.34	Tm II	65	5279.65	Mo I
120	5239.24	Eu I	22	5256.47	Er II	100	5268.01	Cd II	50	5279.70	Dy II
250	5239.79	Nd II	3	5256.61	Ge III	26	5268.52	Co I	75	5280.05	Zr I
350	5239.82	Sc II	20	5256.85	Yb III	200	5268.59	Cu III	11 h	5280.12	Rh I
20	5240.20	V I	4800	5256.90	Sr I	65	5268.78	Gd I	150	5280.21	Al II
29	5240.39	Nb I	27	5257.02	Er II	20	5268.95	Mo I	19	5280.29	Cr I
35	5240.51	Yb II	45	5257.04	U II	14	5269.27	Rh I	70	5280.38	U I
180	5240.81	Y I	40	5257.07	Ru I	500	5269.36	I II	45 h	5280.65	Co I
110	5240.87	V I	40	5257.49	Yb II	120	5269.48	Nd II	40	5280.82	Ru I
230 h	5240.88	Mo I	40	5257.71	Sr III	1200	5269.537	Fe I	210	5280.86	Mo I
40	5242.38	Ru I	280	5258.33	Sc I	10000	5269.86	Pu I	75	5281.05	Tb I
110 h	5242.81	Mo I	35	5258.360	Th I	50	5269.92	Nb I	15	5281.069	Th I
18	5243.31	Fe III	150	5259.04	Mo I	100	5269.991	Cu II	185	5281.20	N I
30	5243.40	Cr I	110	5259.39	La II	25	5270.27	Ca I	30	5281.789	Fe I
30	5243.47	Zr I	680	5259.73	Pr II	64	5270.28	Be II	55	5282.07	Dy I
110	5243.99	Hf I	70	5259.88	Dy I	40 h	5270.3	Bi II	16	5282.30	Fe III
100	5244.11	Yb I	55	5259.99	Ti I	800	5270.357	Fe I	40	5282.39	Ti I
35 c	5244.47	Ho I	20	5260.034	Rb I	200	5270.51	Rb II	55	5282.48	Gd I
100	5245.51	Mo I	16	5260.17	Mo I	500	5270.64	Pm II	150	5282.82	Eu I
3000 c	5245.71	I II	200 c	5260.22	Tc I	500	5270.81	Be II	250	5282.91	Sm I
260	5245.92	Ce I	1	5260.228	Rb I	1300	5270.95	Re I	280	5283.08	Gd I
21	5246.15	Ti I	18	5260.26	Fe II		5271.	Li I	10	5283.28	Ra I
400	5246.33	Pm II	13 1	5260.34	Fe III	370	5271.19	La I	140	5283.45	Ti I
55	5246.57	Ti I	25	5260.44	Hf II	400	5271.40	Sm I	60	5283.621	Fe I
65	5246.87	Gd I	500	5260.44	Xe II	270	5271.53	Nb I	290	5283.77	Al II
50	5246.94	Dy II	130	5260.56	Dy I	100	5271.60	Cd II	20	5283.84	Mo I
55	5247.10	Hf II	14	5260.93	Tm II	35	5271.80	Mo I	20	5283.89	Os I
75	5247.31	Ti I	17	5260.98	V I	10000	5271.95	Bk I	130	5284.08	Ru I
11	5247.37	Ca III	65	5261.14	Mo I	390	5271.96	Eu I	35	5284.39	Ti I
11	5247.49	Ti III	200 c	5261.44	Tc I	13	5271.98	Ca III	1500	5284.70	Pr III
290	5247.56	Cr I	150	5261.68	Pr III	35	5272.01	Cr I	12	5284.83	Fe III
95	5247.654	Th II	22	5261.71	Ca I	50	5272.25	Dy II	35	5284.97	Sc I
1	5247.71	Sb III	19	5261.75	Cr I	9	5272.37	Fe III	28	5284.99	Dy II
45	5247.75	U II	100 h	5261.76	Au I	110	5272.48	Eu I	800	5285.07	Tc I
50	5247.93	Co I	500	5261.95	Xe II	25	5272.48	Nb I	50	5285.26	Nb I
13	5247.95	Fe II	75 w	5262.11	Tb II	300	5272.68	Br II	60	5285.27	Ca II
75	5248.71	Tb I	50 h	5262.16	V IV	80	5272.91	Er I	210	5285.76	Sc I
200	5248.77	In III	30	5262.21	Sr III	55	5272.91	Gd I	150	5285.85	Al II
50	5248.86	Re I	23	5262.24	Ca I	14	5272.98	Fe III	22	5286.09	Hf I
800	5249.37	Cs II	150	5262.42	Pm II	590	5273.43	Nd II	10	5287.19	Cr I
720	5249.59	Nd II	12	5262.74	In I	30	5273.44	Cr I	55	5287.25	Eu I
20	5250.46	Os	55bl	5263.3	DyO	400	5274.04	Cs II	30	5288.32	Sr III
200	5250.82	Nd II	55	5263.50	Ti I	340	5274.23	Ce II	26	5288.81	Ti
21	5250.95	Ti I	3000	5263.58	Y III	24	5275.03	Tb I	60	5289.25	Eu I
320	5251.18	Gd I	180	5263.88	Pr II	55	5275.04	Hf I	60	5289.82	Y II
13	5251.23	Fe II	530	5264.15	Cr I	95 h	5275.17	Cr I	20	5290.74	Hg I
150 d	5251.62	Nb I	11	5264.18	Fe II	50	5275.29	Dy II	140	5290.84	La II
55	5251.67	Ru I	8	5264.21	Mg II	55	5275.48	Ho I	40	5291.14	Tm I
	5251.81	Nb I	22	5264.24	Ca I	1000	5275.51	Tc I	40	5291.16	Ru I
65	5251.82	Ho I	7	5264.37	Mg II	1600cw	5275.56	Re I	120	5291.26	Eu I
260	5251.92	Sm I	1000	5264.44	Pr III	35 h	5275.69	Cr I	110	5291.67	Nd I
110	5252.11	Ti I	35	5264.77	Er II	70 h	5276.03	Cr I	340 c	5292.02	Pr II
120	5252.14	Gd II	30	5264.95	Hf II	130 c	5276.20	Nb I	55	5292.08	Mo I
100	5252.23	Mn III	55	5265.15	Os I	35	5276.28	Mo I	14	5292.14	Rh I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
2000	5292.22	Xe II	30	5305.56	Re I	25	5321.26	Zr I	1000	5337.48	Cd II
1650	5292.52	Cu I	55	5305.87	Tm II	35	5321.28	Re I	55	5337.53	Gd I
340	5292.62	Pr II	11	5306.18	Fe II	11	5321.29	Ca III	65 w	5337.90	Tb I
140	5292.68	N I	20	5306.26	Mo I	130	5321.50	Gd I	10000	5338.22	I II
680	5293.17	Nd II	110	5306.47	Nd II	280	5321.78	Gd I	1	5338.3	Ga II
35	5293.46	Mo I	350	5306.61	Cs II	3	5322.380	Rb I	12	5338.43	Zr I
60	5293.68	Eu I	55	5306.70	Gd I	10	5322.74	Fe III	35 d	5338.59	Tb I
200	5293.92	Pm II	10	5306.76	Fe III	430	5322.76	Pr II	35	5338.90	Tm I
40	5294.32	Tm I	15	5306.88	Ti III	400	5322.80	I II		5339.03	Tm I
10	5294.397	Th I	650	5307.12	Tm I	16	5322.99	Tm II	10000 s	5339.13	Cf
120	5294.64	Eu I	70	5307.22	Ca II	350	5323.23	Po I	50	5339.19	Ca II
60	5294.82	Zr I	280	5307.30	Gd I	12	5323.28	K I	2000	5339.33	Xe II
120	5294.87	Hf I	30	5307.466	Th II	150	5324.178	Fe I	95	5339.41	Sc I
30 h	5295.19	Si II	30	5307.82	Hf I	12	5324.26	Hf II	14	5339.59	Fe II
55	5295.47	Mo I	29	5308.19	Tb I	20	5324.47	Mo I	13	5339.69	K I
120	5295.63	Pd I	8	5308.65	Zn I	50	5324.69	Dy I	80	5339.928	Fe I
20	5295.65	Os I	200	5308.66	Kr II	60	5325.145	Th II	1500	5340.02	Pr III
65	5295.79	Ti I	100	5308.86	Pm II	50	5326.976	Th I	65	5340.30	Dy I
400	5296.13	P II	40	5309.02	Dy II	35	5327.06	Mo I	14	5340.44	Cr I
35	5296.34	Nb I	260	5309.27	Ru I	150	5327.18	N III	110	5340.67	La II
130	5296.56	Ce I	300	5309.27	Xe II	110	5327.32	Gd I	12	5340.74	Ir I
340	5296.69	Cr I	150 c	5309.45	In II	50	5327.46	Re I	50	5340.80	Nb I
120	5296.79	Zr I	29	5309.46	Tb I	800	5328.038	Fe I	500	5341.023	Fe I
120	5297.26	Ti I	1 h	5309.49	Si IV	10	5328.06	Ca III	120	5341.05	Sc I
70 h	5297.36	Cr I	45	5309.68	Hf I	130	5328.08	Ce I	140	5341.05	Ta I
30	5297.743	Th I	5	5310.24	K II	65	5328.30	Gd I	160	5341.06	Mn I
40	5297.82	Dy II	7	5310.24	Zn I	340 h	5328.34	Cr I	20	5341.094	Ne I
45	5298.06	Hf II	9	5310.88	Fe III	300	5328.531	Fe I	110	5341.29	Sm I
230	5298.09	Pr II	7	5311.02	Zn I	135	5329.10	O I	17	5341.50	Ti I
11	5298.12	Fe III	110	5311.40	Zr I	70 h	5329.17	Cr I	50	5342.71	Co I
660	5298.27	Cr I	220	5311.46	Nd II	160	5329.68	O I	95	5342.96	Sc I
12	5298.43	Ti III	55	5311.60	Hf II	17 h	5329.72	Cr I	12	5342.97	K I
65	5298.44	Ti I	35	5312.002	Th I	40 h	5329.74	Rh I	300	5343.00	Gd I
40	5298.78	Os I	110	5312.32	Al II	350 h	5329.82	Sr I	8	5343.283	Ne I
400	5299.78	I II	18	5312.57	Pd I	20	5330.080	Th I	26	5343.39	Co I
12	5299.93	Fe III	24	5312.88	Cr I	80	5330.11	Ho I	25	5343.58	Nb I
1500	5299.99	Pr III	1000	5313.87	Xe II	190	5330.54	Ce II	60	5343.581	Th I
35	5300.21	Tm I	55	5313.89	Mo I	400	5330.57	Br II	22	5343.94	Er II
85	5300.75	Cr I	90	5314.35	N III	190	5330.74	O I	460	5344.17	Nb I
17	5300.94	Yb II	14	5314.79	Rh I	25	5330.778	Ne I	30	5344.50	Er II
40	5301.02	Pt I	400	5314.96	Tc I	22	5330.84	Zr I	300	5344.75	P II
26	5301.06	Co I		5315.	Li I	35	5331.04	Tb I	10	5344.76	Cr I
16	5301.20	Ti III	35	5315.04	Mo I	14 h	5331.08	Rh I	15	5345.10	Pd I
90	5301.25	Ho I	13	5315.33	Ru I	500	5331.23	As II	85	5345.13	Gd I
10	5301.32	Ca III	50	5315.55	Nb I	20	5331.54	Yb III	5000 c	5345.15	I II
160	5301.58	Dy I	220	5316.07	Al II	70	5331.77	Sc I	30 d	5345.66	Yb II
280	5301.67	Gd I	250	5316.07	P II	20	5331.90	Re I	75	5345.68	Gd I
35	5301.94	Sc I	13	5316.23	Fe II	500	5332.05	Br II	780	5345.81	Cr I
60	5301.97	Zr I	5	5316.78	Hg I	10	5332.36	Sn II		5345.83	Yb II
370	5301.98	La II	17	5317.01	Nb I	20	5332.76	Re I	1	5345.98	Mg I
160	5302.28	Nd II	20	5317.28	Re I	100	5332.899	Fe I	11	5346.03	Os I
25	5302.299	Fe I	20	5317.494	Th I	40	5332.93	Ru I	9	5346.30	Hf II
45	5302.30	Er II	400	5317.78	Cu III	55	5333.06	Er I	80	5346.49	Tm II
13	5302.58	Os I	22	5318.35	Sc II	170	5333.30	Gd I	11	5346.88	Fe III
14 w	5302.60	Fe III	150	5318.58	Pm II	27	5333.33	Er II	30	5347.	Bi IV
140	5302.62	La II	250	5318.60	Nb I	500	5333.41	Kr II	60	5347.22	Yb II
35	5302.69	Tm I	24	5318.78	Cr I	10 h	5333.62	Ag I	24	5347.83	Tb II
220	5302.76	Gd I	110	5319.23	Tb I	20	5333.85	Re I	1800	5347.95	Gd III
	5303.13	Sr II	35	5319.24	Ho I	27	5334.23	Er II	90	5348.06	Er I
180	5303.55	La II	50	5319.49	Nb I	14	5334.23	Sc II	380	5348.32	Cr I
90	5303.85	Eu I	35	5319.65	Ho I	45 h	5334.70	Ru I	200	5348.67	Gd I
350	5304.10	Br II	500	5319.82	Nd II	200	5334.79	Tc I	80	5349.12	Lu I
17	5304.21	Cr I	20	5319.89	Mo I	75	5334.87	Nb I	350	5349.16	Cs II
40	5304.40	Lu I	10000 s	5320.09	Cf	170	5335.15	Yb II	350	5349.30	Sc I
65	5304.72	Tb I	600	5320.20	Tc I	110	5335.93	Ru I	9	5349.31	Rh I
80	5304.86	Ru I	10	5320.29	Ra I	18	5336.23	Os I	27	5349.47	Ca I
2 h	5304.97	Si IV	190	5320.60	Sm I	25	5336.81	Nb I	120	5349.71	Sc I
100	5305.31	Tc I	45	5320.78	Y II	26	5336.81	Ti II	19	5349.88	Mn I
360	5305.4	Se II	200	5320.82	N III	24	5337.43	Dy II	30	5350.09	Zr II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
60	5350.30	Sc I	12	5363.35	Zr I	200	5381.89	Cd II	11	5397.87	V I
30	5350.35	Zr II	1	5363.5	Ga II	20	5382.37	Zr I	20 h	5398.26	DyO
300	5350.38	Gd I	30	5363.66	Yb I	60	5383.37	Fe I	20	5398.93	Ti IV
30 h	5350.41	Eu I	12	5363.76	Fe III	35	5383.43	V I	20	5399.175	Th I
18000	5350.46	Tl I	110hl	5364.28	Mo I	4000	5383.64	Y III	50	5399.49	Mn I
45	5350.47	Er I	35	5364.32	Ir I	30	5384.56	Ho I	10	5399.80	Ra I
340	5350.74	Nb I	25	5364.87	Fe I	30	5384.63	Hg I	24	5399.93	Dy II
25	5350.90	Zr I	95	5365.38	Gd I	15 d	5384.85	Tl II	20	5400.23	Ra I
75	5351.08	Ti I	100	5365.5	Se I	30	5384.97	Ho I	70	5400.46	Na II
14	5351.126	Th I	100	5365.59	Mn III	40	5385.14	V I	27	5400.46	Tm II
30 h	5351.29	Yb I	3000	5365.96	Gd III	270	5385.14	Zr I	50	5400.47	Mo I
75 h	5351.69	Eu I	26	5366.65	Ti I		5385.45	Sr II	60	5400.562	Ne I
25	5351.92	Zr I	30	5367.1	Xe III	20	5385.63	Dy II	40	5400.61	Cr I
50	5352.05	Co I	35hl	5367.11	Mo I	65	5385.88	Ru I	50	5401.0	Xe III
30	5352.11	Dy I	40	5367.47	Fe I	110	5385.90	Nd II	110 h	5401.04	Ru I
13	5352.25	Os I	10	5367.64	Pb II	55	5386.19	U II	40	5401.39	Ru I
60 h	5352.32	V IV	10	5368.06	Fe III	30	5386.65	Zr I	9	5401.54	Mg II
20	5352.35	Mo I	200	5368.07	Xe II	300	5386.88	P II	100	5401.93	V I
200	5352.40	Pr II	30	5368.20	Dy II	30	5386.98	Cr I	15	5402.06	Fe II
40	5352.84	Eu I	140	5368.36	Sm I	14	5387.06	Fe II	29 d	5402.06	Tb II
150	5352.95	Yb II	100	5368.383	Cu II	22	5387.57	Cr I	27	5402.23	Tm I
240	5353.26	Gd I	35	5368.85	Er I	17	5388.30	Nb I	200	5402.51	Ta I
40	5353.28	Nb I	12	5368.99	Pt I	14	5388.30	V I	500	5402.57	Lu I
40	5353.41	V I	20	5369.281	Th I	26	5388.69	Mo I	1000 s	5402.62	Am I
26	5353.48	Co I	17	5369.39	Zr I	40	5389.18	Ti I	450	5402.77	Eu I
500 c	5353.48	Tc I	35	5369.48	Re I	40	5389.34	Hf I	220	5402.78	Y II
2	5353.49	Ga I	35	5369.58	Co I	85	5389.50	Gd I	20	5403.04	Be II
450	5353.53	Ce II	55	5369.64	Ti I	85	5389.58	Dy II	70	5403.17	Ho I
12	5353.77	Fe III	75	5369.72	Tb I	17	5389.84	Yb II	16	5403.43	Os I
60	5354.05	Hg I	300	5369.79	Cu III	55	5389.99	Ti I	35	5404.02	Ti I
20	5354.24	Sb II	50 c	5369.80	Re I	10	5390.39	Cr I	60	5404.12	Fe I
130	5354.40	Rh I	1000 c	5369.86	I II	95	5390.44	Rh I	50	5404.19	Dy I
110	5354.73	Hf I	120	5369.9	Se I	70	5390.466	Th II	19	5404.47	Hf I
80	5354.88	Mo I	95	5369.92	Gd I	4	5390.568	Rb I	10000 l	5404.62	Bk I
160	5354.88	Tb I	50	5369.96	Fe I	60	5390.63	Na II	23 h	5404.73	Rh I
90	5355.10	Eu I	150	5370.63	Gd I	12	5390.79	Pt I	22	5405.00	Cr I
25	5355.31	Nb I	800	5370.97	Cs II	30	5391.03	Sr III	25	5405.13	Zr I
35	5355.51	Mo I	400	5371.489	Fe I	17	5391.18	Zr I	130	5405.23	Sm I
40	5355.70	Nb I	150	5371.84	Al II	19	5391.36	Hf II	45	5405.33	Eu I
210	5355.75	Sc I	150	5371.94	Nd II	1000	5391.60	Ba II	100 h	5405.34	Si II
8	5356.07	V V	10	5372.099	Pb II	14	5391.96	Tm II	800 c	5405.42	I II
530	5356.10	Sc I	500	5372.39	Xe II	10000	5392.03	Bk I	250	5405.774	Fe I
23	5356.47	Rh I	35	5372.40	Mo I	370	5392.08	Sc I	35	5405.79	Mo I
65	5356.48	Mo I	27	5372.98	Tm II	15000	5392.12	Cl II	14	5405.98	Tm II
200	5356.63	Tc I	110	5373.86	Hf I	50	5392.572	Th I	35	5406.39	Mo I
180	5356.98	Nd II	110	5374.1	Se I	100	5392.80	Xe I	20	5406.81	Ra I
14	5357.19	Sc II	500 h	5375.20	Tc I	120	5392.94	Eu I	100	5407.08	Ho I
540	5357.61	Eu I	40	5375.27	Nb I	40	5393.167	Fe I	800 c	5407.36	I II
110	5357.86	La I	270	5375.35	Sc I	300	5393.40	Ce II	95	5407.42	Mn I
30	5358.64	Yb II	11 l	5375.47	Fe III	18 h	5393.85	Ho I	85	5407.62	Zr I
300	5358.65	Tc I	75	5375.98	Tb I	10000	5394.24	Bk I	100	5408.13	As I
30	5358.707	Th I	100	5376.13	Th III	65	5394.52	Mo I	10000	5408.88	Cf I
29	5359.19	Nb I	110	5376.79	Os I	95	5394.67	Mn I	280	5409.23	Ce II
14	5359.57	K I	110	5376.94	Eu I		5395.	Li I	110	5409.61	Ti I
90	5359.99	Ho I	130	5377.09	La II	35	5395.24	Pd I	200	5409.72	P II
200	5360.14	Tc I	100 c	5377.10	Re I	1200	5395.48	Br I	1400	5409.79	Cr I
560hl	5360.56	Mo I	95	5377.63	Mn I	40	5395.57	Dy I	7	5409.92	Tl II
2	5360.6	Ga II	65	5377.84	Ru I	10	5395.69	Ti III	20	5410.21	Be II
60	5360.83	Eu I	1000	5378.13	Cd II	12	5395.86	Fe II	200	5410.45	Pm II
800	5361.35	Ba II	250	5378.20	P II	21	5395.86	Nb I	30	5410.91	Fe I
290	5361.47	Nd II	30	5378.836	Th I	35	5395.87	Er II	10	5410.97	Tl II
120	5361.61	Eu I	45	5379.10	Rh I	17	5395.88	Zr I	29	5411.24	Nb I
55	5361.66	Gd I		5379.13	Sr II	29	5396.33	Nb I	80	5411.41	In II
130	5361.77	Ru I	300	5380.34	C I	17	5396.60	Ti I	5	5411.52	He II
17	5362.01	Nb I	75	5380.62	Y I	85	5397.09	Ti I	45	5411.86	Eu I
4	5362.40	Tl III	140	5380.99	La II	300	5397.127	Fe I	13	5412.14	Os I
75	5362.56	Zr I	10000	5381.02	Pu I	35	5397.38	Mo I	1100	5412.62	Gd III
40	5362.601	Rb I	40	5381.34	Nb I	150	5397.64	Ce I	85	5413.20	Gd I
200	5363.20	Xe II	55	5381.40	Ho I	10	5397.8	Bi II	14	5413.62	Ho II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
29	5413.65	Tb I	55	5427.59	Ru I	35 h	5445.23	Rh I	5600	5457.02	Cl II
35	5413.69	Mn I	100	5427.70	Pr III	30	5445.39	Ho I	22	5457.30	Os I
17	5413.93	Zr I	30	5427.83	Fe II	300	5445.45	Xe II	12	5457.47	Mn I
90	5414.55	Na II	25	5428.42	Zr I	270	5446.20	Sc I	40	5457.62	Eu I
60	5414.63	Er II	360	5428.6	S II	150	5446.38	Ac II	40	5458.04	Nb I
60	5415.20	Fe I	200	5428.79	Ba II	40	5446.64	Ti I	17	5458.12	V I
140	5415.26	V I	15 h	5428.92	Si II	100	5446.80	Br III	100	5458.31	P I
85	5415.69	Gd I	150	5429.04	Pm II	200	5446.871	Fe I	55	5459.81	Tb I
45	5416.12	Sc I	75	5429.15	Ti I	22	5446.93	Os I	400	5460.39	Xe II
29	5416.20	Tb I	45	5429.41	Sc I	50	5447.18	Th III	55	5460.51	Ti I
21	5416.30	Nb I	250	5429.695	Fe I	20 h	5447.26	Si II	26	5460.53	Mo I
120	5416.34	Os I	13	5429.99	Fe II	18	5447.39	Sc I	25	5460.64	Re I
45	5416.69	Os I	21	5431.26	Nb I	200	5447.40	Tc I	1100	5460.74	Hg I
3	5416.8	Ga II	160	5431.53	Nd II	11	5447.76	Os I	1100	5460.753	Hg I
24	5417.03	Y I	75	5431.532	Rb I	14	5447.92	Re I	125	5461.20	P II
15 h	5417.24	Si II	3	5431.830	Rb I	19	5448.31	Nb I	14	5461.95	Tm II
40	5417.38	Mo I	25	5431.90	Re I	11bl	5448.34	TiO	35	5462.43	Er II
24	5417.486	Th I	35	5432.55	Mn I	35	5448.57	Zr I	30	5462.615	Th II
28	5417.51	Os I	14	5432.71	Yb II	30	5448.90	Ti I	30	5463.38	Hf II
28	5418.09	V I	650	5432.8	S II	21	5449.16	Ti I	30	5463.90	Sr III
140 c	5418.45	In II	15 h	5432.89	Si II	140	5449.24	Ce I	19	5463.97	Cr I
350	5418.48	Cu III	35	5432.94	Sc I	40	5449.27	Yb II	15	5464.08	Sb II
40	5418.86	Ru I	55	5433.23	Sc I	20	5449.37	Os I	14	5464.14	Tm I
80	5419.13	Dy I	40	5434.18	V I	40	5449.479	Th II	2000 c	5464.62	I II
3000	5419.15	Xe II	16	5434.39	Ho II	75	5449.50	Ir I	18	5465.20	Sc I
130	5419.19	Ta I	100	5434.523	Fe I	10000	5449.63	Bk I	1000	5465.50	Ag I
70	5419.42	Lu III	300	5435.07	Br II	18	5449.8	Ho II	14	5465.54	Tm II
500	5419.69	Cs II	90	5435.18	O I	50	5449.84	Te II	23	5465.57	Mo I
85	5420.36	Mn I	55	5435.68	Mo I	200	5450.45	Xe II	16	5465.93	Fe II
110	5420.38	Ce I	12	5435.78	Hf I	40	5450.51	Mo I	5 c	5465.944	Cs I
3	5420.38	Th IV	110	5435.78	O I	400	5450.74	P II	1200	5466.22	Br I
200	5421.05	Ba II	3000	5435.83	I II	1500	5450.84	Sr I	500 h	5466.43	Si II
55	5421.07	Eu I	18	5435.87	Ho I	95	5451.11	Dy I	710	5466.46	Y I
5	5421.352	Ar I	8	5435.87	Ni I	110	5451.12	Nd II	140	5466.72	Sm I
1	5421.6	Ga II	50	5435.893	Th II	18 h	5451.30	Er I	500 h	5466.87	Si II
20	5421.86	Zr I	220 w	5436.70	In II	135	5451.32	As I	20	5466.94	Fe II
140 c	5421.90	Lu I	26	5436.73	Ti I	120	5451.34	Sc I	10000 l	5467.47	Bk I
65	5422.44	Nb I	135	5436.86	O I	6	5451.46	Si III	100	5467.64	Pm II
400	5422.78	Br II	14	5437.03	Re I	380	5451.51	Eu I	6	5467.81	La III
18	5422.81	Er II	110	5437.27	Nb I	10	5451.652	Ar I	19 h	5468.10	Nb I
150 c	5423.05	Tc I	11	5437.66	V I	30 h	5451.90	Ho I	23 h	5468.11	Rh I
99000	5423.23	Cl II	65	5437.75	Mo I	500 c	5451.90	Tc I	200	5468.17	Kr II
70	5423.32	Dy I	25	5437.76	Zr I	13	5452.71	Ru I	90	5468.32	Er I
10000	5423.51	Cl II	100	5437.88	Lu I	75	5452.92	Hf I	140	5468.37	Ce II
28	5424.02	Hf I	1000	5438.00	I II	260	5452.94	Eu I	55	5468.40	Sc I
60	5424.07	Fe I	45	5438.22	Sc I	220	5453.00	Sm I	100	5468.47	Y I
60 h	5424.07	Rh I	190	5438.24	Y I	20	5453.40	Os I	24	5469.10	Dy II
50	5424.08	V I	17	5438.32	Ti I	65	5453.46	Gd I	100 h	5469.21	Si II
50	5424.10	Tb II	100 h	5438.62	Si II	35	5453.57	Lu I	7	5469.40	Ir I
30	5424.27	Dy I	40	5438.74	Hf I	35	5453.65	Ti I	28	5470.00	Os I
90	5424.37	Y I	800	5438.96	Xe II	1000	5453.8	S II	6	5470.13	K II
200	5424.54	Pm II	55	5439.03	Sc I	14	5454.0	Ho II	29 w	5470.34	Tb II
100	5424.55	Ba I	26 l	5439.21	Ru I	150	5454.07	Mn III	60	5470.64	Mn I
1000 s	5424.70	Am I	12	5439.58	Rh I	35	5454.27	Er II	15	5470.759	Th I
19	5424.72	Rh I		5440.	Li I	15 h	5454.49	Si II	35 h	5470.85	Rh I
180	5424.79	Pm II	15	5440.41	Zr I	30	5454.50	Ir I	8	5470.98	Ti IV
350	5424.99	Br II	12 h	5441.36	Rh I	80 h	5454.82	Ru I	75	5471.21	Ti I
19 h	5425.45	Rh I	16	5441.82	Os I	500	5455.15	La I	13	5471.33	V
45	5425.57	Sc I	12	5442.41	Cr I	30	5455.21	Sc I	100	5471.55	Ag I
1	5425.6	Ga II	55 h	5442.60	Sc I	25	5455.45	Fe I	300	5471.96	Tc I
60	5425.678	Th II	55	5443.31	Os I	30	5455.47	Dy II	60	5472.19	Sc I
400	5425.91	P II	30	5443.34	Dy II	120	5455.609	Fe I	140	5472.29	Ce II
40	5426.26	Ti I	19000	5443.37	Cl II	100	5455.95	Tc I	90	5472.32	Eu I
15	5426.36	Zr I	35	5443.38	Tb I	90	5456.13	Ru I	1000	5472.61	Xe II
29 c	5426.43	Tb I	40	5443.48	Sr III	19	5456.19	Nb I	35	5472.70	Ti I
40	5426.70	Dy II	40	5443.56	Eu I	100 h	5456.45	Si II	7	5473.05	Si III
23	5426.89	Mo I	14	5444.07	Hf II	35	5456.46	Mo I	90	5473.39	Y II
90	5426.94	Eu I	10000	5444.21	Cl II	180	5456.62	Er I	40 h	5473.55	Ti I
600 c	5427.06	I I	9 h	5444.32	Rh I	29	5457.00	Tb I	1000	5473.6	S II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
85	5474.23	Ti I	300	5488.79	Br II	28	5504.87	V I	10	5518.05	Zr I
30	5474.46	Ti I	25	5489.94	V I	40	5505.49	Yb I	1	5518.19	La III
13	5474.58	Os I	150	5490.15	Ti I	20	5505.66	Ta I	90	5518.91	Ta I
18	5474.64	Sc I	35	5490.28	Mo I	30	5505.87	Mn I	200	5519.05	Ba I
200	5474.68	Mn III	30 h	5490.32	Sb I	5	5506.113	Ar I	13	5519.38	Pr II
10	5474.92	Zr I	26	5490.84	Ti I	18	5506.20	Fe II	60	5519.88	Lu III
13	5475.13	Os I	13	5491.06	Nb I	7800	5506.49	Mo I	23	5520.04	Mo I
13 h	5475.18	Ru I	800	5491.50	I II	28	5506.52	Dy I	14 h	5520.05	Re I
20	5475.38	Ag I	55	5491.90	La III	500	5506.69	Br II	20 c	5520.31	Pr II
80	5475.70	U II	20	5492.17	Mo I	30	5506.778	Fe I	660	5520.50	Sc I
14	5475.77	Pt I	18	5492.51	Ti IV	80 c	5506.89	Tc I	26	5520.64	Mo I
35	5475.90	Mo I	160	5492.95	U II	140 c	5507.08	In II	25	5521.10	Re I
12	5476.12	Rh I	60	5493.17	Y I	200	5507.19	P II	9	5521.15	Ta I
2100	5476.69	Lu II	40	5493.23	Si I	70	5507.75	V I	120	5521.63	Y I
180	5476.91	Ni I	230	5493.72	Sm I	25	5507.87	Zr I		5521.70	Y II
9	5477.27	Os I	26 h	5493.80	Mo I	10	5508.61	W I	12	5521.78	Ru I
10	5477.40	Zr I	14	5493.83	Fe II	40	5508.79	Pr II	2600	5521.83	Sr I
18	5477.47	Er II	100 l	5494.86	Xe II	17	5509.12	Nb I	600 c	5522.06	I II
120 h	5477.71	Ti I	250 d	5494.94	Cu III	65	5509.15	Pr II	285	5522.4	Se II
200	5477.75	P I	300	5495.06	Br II	22	5509.33	Os I	5000	5522.78	Rb II
35	5478.33	Zr I	45	5495.20	Eu I	2	5509.60	Mg I	45 c	5522.79	Pr II
350	5478.47	Br II	150	5495.45	Pm II	55	5509.61	Tb I	250 w	5523.28	In II
14	5478.50	Pt I	35	5495.59	Y I	1000	5509.7	S II	270	5523.53	Os I
14	5478.50	Yb II	450	5495.67	N II	250	5509.90	Y II	50	5523.57	Nb I
55	5479.40	Ru I	25	5495.874	Ar I	35	5509.994	Th I	5	5523.97	Pb III
70	5480.26	U II	10	5496.137	Th I	6	5510.00	Ni I	10	5523.98	Ta I
300	5480.30	Ba II	200 h	5496.45	Si II	15	5510.12	Hf I	150	5524.11	Tc I
26	5480.30	Ru I	26	5496.69	Ru I	15	5510.45	Hf I	65	5524.12	Tb I
19	5480.50	Cr I	28	5496.83	Dy I	120	5510.52	Eu I	28 c	5524.15	Pr I
90	5480.74	Y II	1000 c	5496.94	I II	130	5510.71	Ru I	19	5524.35	Hf II
35	5480.83	Zr I	15	5497.30	Hf I	10000	5510.72	Pu I	40	5524.4	Xe III
7000	5480.84	Sr I	240	5497.41	Y II	12	5510.78	Fe II	17	5524.54	Yb I
40	5481.00	Nb I	27	5497.44	Er II	14	5511.18	V I	12	5524.584	Th I
10	5481.16	Zr I	130 c	5497.50	In II	16 c	5511.63	Pr II	200	5525.53	Xe II
70	5481.20	U II	25	5497.516	Fe I	2	5511.72	La III	24 c	5525.62	Tb I
40	5481.40	Mn I	340	5497.727	As II	40	5511.78	Ti I	45	5525.72	Nd I
12	5481.42	Rh I	26	5498.49	Mo I	260	5512.08	Ce II	28 c	5525.91	Pr II
110	5481.43	Ti I	10000	5498.50	Pu I	80	5512.10	Sm I	45	5526.06	Sc I
24	5481.45	Tb I	30 c	5498.57	Ho I	10000	5512.22	Bk II	40	5526.52	Mo I
16	5481.85	Os I	2	5499.4	Tl III	20	5512.37	Ru I	30	5526.63	Eu I
75	5481.87	Ti I	17	5499.53	Nb I	340	5512.53	Ti I	24	5526.76	Y I
60	5481.92	Yb I	200	5499.73	P II	500	5512.55	Rb II	5	5526.80	Lu III
750	5481.99	Sc I	16	5500.30	Tm II	35 c	5512.82	Nb I	660	5526.82	Sc II
8	5482.13	Ra I	27	5500.49	W I	23	5512.98	Ca I	14	5526.82	Tm II
16	5482.31	Fe II	18	5500.68	Ta I	320 c	5513.00	In II	40	5526.97	Mo I
45	5482.53	U II	15	5500.83	Eu I	6	5513.263	Ge I	740	5527.54	Y I
70	5483.01	Tc I	13	5501.02	Ru I	55	5513.58	Pr II	70	5527.82	U II
13	5483.09	Nb I	470	5501.34	La I	60	5513.64	Y I	16 c	5527.93	Pr I
45	5483.34	Co I	10	5501.43	Kr III	570	5514.22	Sc I	30	5528.01	Dy I
19	5483.49	Nb I	20	5501.464	Fe I	270	5514.35	Ti I	100	5528.23	Tc I
600 c	5483.55	Li II	35	5501.47	Nd I	50	5514.54	Tb I	24	5528.34	Tm I
200	5483.55	P II	16	5501.50	Pr I	320	5514.54	Ti I	13	5528.36	Ta I
24	5484.147	Th II	50	5501.54	Mo I	220	5514.68	W I	6	5528.41	Mg I
16	5484.23	Rh I	8	5501.74	Sc IV	28	5515.12	Pr II	75	5528.41	Zr I
80	5484.32	Ru I	23	5501.87	Mo I	16	5515.39	Sc I	12	5529.06	Fe II
10000 s	5484.58	Bk I	10	5501.98	Ra I	24	5515.41	Dy II	45	5529.54	La III
530	5484.62	Sc I	140	5502.12	Zr I	27	5515.56	Ho II	13	5530.21	Pr I
18	5484.64	Ru I	24	5502.79	Dy I	9	5516.01	Os I	26	5530.49	Ti
60	5485.37	Tc I	5	5502.884	Cs I	27	5516.02	Er I	17	5530.77	Co I
600 c	5485.65	Li II	27	5503.44	W I	230	5516.09	Sm I	12	5530.99	Ru I
170	5485.70	Nd II	300	5503.45	Y I	15 c	5516.27	Ta I	600	5531.07	Xe II
80	5485.97	Er II	26 h	5503.54	Mo I	100	5516.42	Pm II	45	5531.16	Pr I
30	5486.09	Zr I	110	5503.90	Ti I	18	5516.45	Ho II	15	5531.38	W I
1100	5486.12	Sr I	3500	5504.17	Sr I	50	5516.77	Mn I	40	5532.162	Cl I
25	5487.22	V I	19	5504.302	Th I	30	5517.11	Zr I	20	5532.30	Zr I
85	5487.92	V I	30	5504.51	Ho I	17	5517.39	Nb I	50 c	5532.68	Re I
50	5487.95	Te II	40	5504.58	Nb I	35	5517.535	Si I	12	5533.01	Ti III
85 h	5488.20	Ti I	9	5504.65	Rh I	10	5517.72	Ti IV	5200	5533.05	Mo I
120	5488.65	Eu I	1000	5504.72	I II	8	5517.86	Ru I	30	5533.25	Eu I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
90	5533.82	Nd I	100	5550.53	Tc I	285	5566.9	Se II	1000 l	5584.21	Am II
30	5534.33	Ho I	230	5550.60	Hf I	13	5566.91	Pr II	80	5584.44	Os I
2000	5534.81	Sr I	85	5551.35	Nb I	600	5567.27	Y III	140	5584.50	V I
180	5534.96	Pm II	22bl	5551.75	ZrO	60	5567.75	Y I	35bl	5584.7	HoO
29	5535.04	Rh I	21	5551.98	Mn I	8	5567.76	Mn I	25	5584.72	Re I
150	5535.17	Pr II	230	5552.12	Hf I	13	5568.09	W I	30 h	5585.68	Ti
55	5535.27	Nd II	5	5552.25	Sc II	20	5568.11	Yb I	23	5586.00	V I
285	5535.36	N II	10 c	5552.35	Bi I	15	5568.13	Sb II	90	5586.24	Eu I
1000 r	5535.48	Ba I	12	5552.43	F I	40	5568.62	Mo I	20	5586.36	Yb I
130 c	5536.50	In II	13	5552.88	Os I	11	5569.03	Ru I	14	5586.65	Tm II
200	5537.38	Pm I	27	5553.14	Ho I	26	5569.48	Mo I	120	5586.755	Fe I
45	5537.46	Zr I	25bl	5553.17	ZrO	30	5569.618	Fe I	75	5586.83	Eu I
10000	5537.59	Pu I	4000	5553.30	Gd III	2000	5570.288	Kr I	50	5586.97	Nb I
15	5537.72	W I	11	5553.42	Pr II	150	5570.33	Eu I	60	5587.026	Th I
40	5537.76	Mn I	10	5553.57	Ra I	2500	5570.45	Mo I	27	5587.61	Nd I
10000 l	5537.93	Bk I	35	5553.59	Sc I	11	5570.58	Ca III	9	5587.86	Ni I
45	5538.02	Hf I	190 w	5555.45	In II	18	5571.24	Sc I	3000	5587.88	Gd III
28	5538.26	Hf I	20	5555.85	Ra I	17 c	5571.44	Nb I	35	5588.20	Sm I
28	5538.37	Pr I	40 h	5556.10	Sb I	45	5571.83	Pr II	250	5588.34	P II
20	5538.78	Pr II	110	5556.25	Ce I	4000	5572.24	Y III	40	5588.45	Yb II
14	5539.03	Tm II	55	5556.28	Mo I	10	5572.541	Ar I	27	5588.76	Ca I
85 h	5539.05	Yb I	75	5556.43	Y I	60	5572.841	Fe I	25	5588.92	Sn II
50	5539.262	Th I	2400	5556.47	Yb I	7	5573.01	Mn I	3000 c	5589.02	Tc I
40	5539.41	Mo I	12	5556.52	Ru I	40	5573.354	Th I	160	5589.27	F II
70	5539.911	Th II	26	5556.72	Mo I	45	5573.42	Sm I	350	5589.94	Br II
2000	5540.05	Sr I	10000 l	5556.80	Bk I	25	5573.47	Re I	14	5589.94	Tm II
18	5540.52	F I	120	5556.88	Pm II	8	5573.68	Mn I	24	5590.12	Ca I
24	5540.66	Ru I	180	5557.06	Al I	50	5573.94	Cu III	10000	5590.54	Pu I
100 h	5540.74	Si II	10000 s	5557.09	Bk I	18	5573.96	Ho II	17 c	5590.95	Nb I
55	5541.04	Sc I	110	5557.95	Al I	11	5574.61	Pr II	21	5590.96	Y I
200	5541.14	P II		5558.	Be I	35	5575.19	Mo I	55 b	5591.1	HoO
25	5541.47	Nb I	425	5558.09	As II	27	5575.50	Nd I	110	5591.33	Sc I
35	5541.63	Y I	50	5558.342	Th I	55	5575.86	Hf I	20	5591.58	Mo I
200	5541.94	Tc I	150	5558.39	Pm II	800	5576.02	Pm II	55 d	5591.85	Gd I
30	5542.54	Eu I	25	5558.702	Ar I	35 c	5576.16	Nb I	18	5592.25	Eu I
55	5542.80	Pd I	35	5558.75	V I	150	5576.35	Te II	13	5592.28	Ni I
50	5543.12	Mo I	10 h	5559.58	Ag I	150 h	5576.66	Si II	55bl	5592.3	HoO
55	5543.24	Nd I	90	5559.75	Ru I	27	5576.70	Nd I	10000	5592.33	Pu I
250 h	5543.36	Sr I	11	5560.62	Os I	240 c	5576.90	In II	110	5592.37	O III
80	5543.63	Tc I	35 c	5560.94	Ho I	200	5577.14	Eu I	100	5592.42	V I
10 c	5544.25	Pb II	16	5561.10	Sc I	10	5577.33	F I	450	5593.23	Al II
40	5544.49	Mo I	55	5561.17	Nd I	120	5577.34	O I	35 h	5593.38	Sc I
120	5544.50	Y I	22	5561.46	Pr II	180	5577.42	Y I	80	5593.46	Er I
21 l	5544.58	Rh I	28	5561.66	V I	27	5577.70	Nd I	21	5594.12	Y I
	5544.61	Y II	200	5561.73	Pm II	35	5578.29	Nb I	240	5594.43	Nd II
13	5544.76	Fe II	20	5561.95	Sn II	21	5578.40	Ru I	26	5594.47	Ca I
55	5545.01	Pr II	45 c	5562.06	Pr I	6	5578.73	Ni I	13	5594.89	Nb I
10 l	5545.20	Ta I	35	5562.09	Yb I	6	5578.788	Rb I	22	5594.92	Pr I
50	5545.32	Zr I	500	5562.224	Kr I	11	5578.81	Pr I	24	5595.064	Th I
20 h	5545.67	Ag I	5	5562.766	Ne I	10	5579.06	Ca III	400	5595.48	Y III
23	5545.93	V I	6000	5562.81	Y III	13	5579.16	Ti	100	5595.88	Ce I
90	5546.02	Y II	29	5563.00	Nb I	75	5579.63	Eu I	2	5596.20	Sn II
800	5546.08	Pm II	1000	5563.02	Cs II	14	5579.76	Sc I	22	5597.29	Pr II
30	5546.40	Sc I	50 c	5563.24	Re I	120	5580.03	Eu I	65bl	5597.85	TiO
22	5546.82	Os I	35 b	5563.6	HoO	80	5580.386	Kr I	130	5597.91	O V
35	5547.02	Pd I	20	5564.05	Mo I	16	5580.66	Os I	1000 s	5598.13	Am I
70	5547.07	V I	70	5564.17	U I	24	5581.08	Y I	25	5598.49	Ca I
65	5547.27	Dy I	60	5564.203	Th II	10000	5581.21	Bk I	600 c	5598.52	I II
200	5547.44	Eu I	8	5564.741	Ge I	22	5581.37	Tm I	15	5598.75	Ta I
35	5548.176	Th I	70	5564.86	Sc I	45	5581.59	U II	3	5599.41	Bi I
20	5548.32	Ta I	280	5564.9	S II	100	5581.74	Pr III	160	5599.42	Rh I
20	5548.33	Pr II	170	5564.97	Ce I	620	5581.87	Y I	30	5599.52	Ta I
55	5548.47	Nd II	110	5565.49	Ti I	25	5581.97	Ca I	17 c	5599.59	Nb I
50	5548.95	Sm I	13	5565.52	Pr I	13	5582.35	Pr II	18	5599.80	Eu I
10000	5549.62	Pu I	35	5565.93	Tb I	21 h	5582.98	Ti	1000	5600.32	I II
30	5549.63	Hg I	130	5565.97	Ce I	200	5583.27	P II	8	5600.50	Os I
9	5549.79	Os I	27	5566.00	Tm I	55	5583.68	Gd II	40 d	5600.65	Dy II
140	5550.40	Sm I	70	5566.52	Ho I	11	5584.02	Pr II	14	5600.77	Hf I
18	5550.40	Sc I	100	5566.62	Xe I	30	5584.02	Ta I	50	5600.86	Sm II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
45 d	5601.14	Er I	35	5620.08	Os I	35 c	5635.42	Nb I	100	5649.561	Kr I
240	5601.28	Ce I	120	5620.14	Zr I	13	5635.51	V I	4	5649.70	Ni I
24	5601.29	Ca I	20	5620.26	Pr I	20	5635.71	Ta I	230	5650.13	Mo I
13	5601.30	Pr II	20 h	5620.40	Ba I	65	5635.76	Nd I		5650.54	Sr II
	5601.32	Er I	2000 c	5620.45	Tc I	17	5635.84	Ti	20	5650.704	Ar I
28	5601.38	V I	220	5620.54	Nd I	5000 c	5635.99	Rb II	19	5650.83	Hf I
55	5601.43	Nd I	40	5620.68	Ta I	30	5636.20	Er I	500	5650.97	Ce III
300 l	5601.70	Np I	9	5620.72	Sc IV	290	5636.24	Ru I	15	5651.11	Eu I
45	5601.92	Nd I	55	5620.78	U I	22	5636.46	Pr II	425	5651.32	As II
3000	5602.08	Y III	7	5621.426	Ge I	200 w	5636.70	In II	60	5651.98	Yb II
30 l	5602.19	Sb I	50	5621.79	Sm I	9	5637.41	Os I	80	5652.01	Dy I
200	5602.23	Tc I	45 c	5621.89	Pr II	55 c	5638.79	Pr II	300 l	5652.75	Np I
110bl	5602.50	LaO	70	5622.01	Er I	29 c	5638.80	Tb I	7	5653.30	Ru I
40	5602.76	Mo I	30	5622.221	Si I	200 h	5639.48	Si II	35	5653.57	Nd I
24	5602.85	Ca I	60	5622.44	Eu I	100	5639.50	Dy I	20	5653.750	Rb I
21	5603.14	Ru I		5622.94	Sr II	45	5639.54	Nd I	17	5654.14	Nb I
40	5603.52	Nb I	110	5623.05	Pr II	70	5639.746	Th II	35	5654.23	Pr II
8	5603.55	Ru I	35	5623.53	Zr I	30	5639.75	Sb II	190	5655.14	Ce I
13	5603.93	Nb I	15	5623.91	Y I	450	5640.0	S II	20	5655.2	Bi II
22	5604.19	Sc I	20	5624.06	F I	40	5640.18	Ta I	14	5655.42	Pd I
13	5604.31	W I	13	5624.20	V I	450	5640.3	S II	100	5655.77	Au I
50	5604.515	Th II	90	5624.45	Pr II	90	5640.36	Er I	70bs	5655.9	HoO
70	5604.94	V I	20	5624.541	Fe I	16	5640.37	Pr II	8	5655.96	Ge I
9 c	5605.50	Ta I	200	5624.60	V I	55	5640.62	Ho I	100	5656.00	Tc I
24	5605.53	Dy I	70	5624.89	V I	80	5640.98	Sc II	10000 l	5656.54	Bk I
90	5605.65	Pr II	5 h	5625.33	Ni I	200	5641.29	Pm II	10	5656.659	Ne I
18	5605.86	Eu I	45	5625.55	Ir I	22	5641.42	Er I	110	5657.44	V I
1000	5606.1	S II	10000	5625.69	I II	11	5641.66	Ru I	130	5657.72	La I
120	5606.33	Y I	70	5626.01	Sm I	170	5642.11	Nb I	250	5657.88	Sc II
14	5606.64	Tm I	55	5626.01	V I	1500	5642.13	Tc I	12	5657.925	Th I
13	5606.68	Pr I	45 b	5626.4	HoO	7	5642.36	Cr I	70	5658.30	Tm I
13	5606.73	Ru I	80	5626.53	Er II	22	5642.56	Os I	60	5658.34	Sc II
35	5606.733	Ar I	12	5626.93	F I	40	5642.60	Tm I	22 h	5658.63	Er II
8	5607.010	Ge I	20	5627.49	Dy I	15	5642.69	Pd I	65 b	5658.9	HoO
30 b	5607.1	HoO	65	5627.60	Ho I	5	5642.73	K II	3000	5658.98	Gd III
10 h	5607.21	Re I	400	5627.64	V I	16cw	5643.16	Pr I	10000	5659.03	Bk I
7	5607.71	Rh I	13	5628.20	Ta I	260	5643.24	Gd I	15	5659.15	F I
16	5608.35	Rh I	30	5628.24	Ho II	85	5644.10	Sm I	300	5659.38	Xe II
23	5608.62	Mo I	25	5628.26	Nb I	250	5644.14	Ti I	140	5659.58	Ho I
20 c	5608.85	Pb II	8	5628.27	Hf I	120	5644.69	Y I	9	5659.62	Rh I
28	5608.93	Pr II	24	5628.64	Cr I	800	5644.94	Tc I	55	5659.84	Pr II
100	5609.00	Cu III	25bl	5629.02	ZrO	100	5645.15	In III	140	5659.86	Sm I
23	5609.23	Mo I	65	5629.17	Nb I	28	5645.25	Os I	650	5659.9	S II
45 h	5609.94	Er I	55bl	5629.28	TiO	35	5645.30	Nb I	9	5660.21	Os I
55	5610.22	Pr II	65	5629.55	Gd I	12	5645.40	Fe II	150 h	5660.66	Si II
100	5610.93	Mo I	25bl	5629.58	ZrO	27	5645.40	Tm I	35	5660.72	W I
60	5611.82	Er I	11	5629.79	Ru I	22	5645.41	Pr II	50	5660.81	Ra I
12	5612.11	Zr I	300	5629.94	Tc I	90	5645.611	Si I	26bl	5661.55	TiO
12 h	5612.27	Re I	560	5630.13	Y I	210	5645.80	Eu I	35 h	5661.57	Pr I
1500	5612.89	I II	7	5630.297	Th I	150	5645.91	Ta I	190	5662.16	Ti I
23	5613.07	Mo I	22	5631.02	Sc I	55 h	5645.99	Dy I	16	5662.19	Pr II
30	5613.23	Dy I	160	5631.22	La I	85	5646.11	V I	350	5662.47	C II
95	5613.27	Hf I	11	5631.27	W I	45	5646.36	Sc I	50	5662.515	Fe I
27	5613.64	Ho I	270	5631.41	Tm I	150	5646.80	Pr III	75	5662.91	Ti I
25	5614.01	Hf I	500	5631.71	Sn I	280	5647.0	S II	740	5662.94	Y II
9	5614.79	Ni I	27	5631.94	W I	17	5647.22	Co I	30 c	5664.018	Cs I
35	5615.320	Th I	100 l	5632.02	Sb I	16	5647.60	Sc I	5	5664.02	Ni I
200	5615.644	Fe I	110	5632.25	Gd I	40	5647.774	Rb I	24	5664.04	Cr I
6	5616.135	Ge I	24	5632.25	Y I	250	5648.07	C II	1000	5664.20	Ce III
10	5616.66	Ra I	13	5632.46	V I	240	5648.25	La I	6	5664.226	Ge I
300	5616.67	Xe II	330	5632.47	Mo I	65	5648.37	W I	160	5664.51	Zr I
9 c	5617.71	Ta I	75	5632.54	Eu I	120	5648.47	Y I	30	5664.66	Sr III
190	5617.91	Gd I	5	5632.77	Rh I	75	5648.58	Ti I	450	5664.7	S II
20	5618.45	Mo I	21	5632.89	Y I	7	5648.98	Os I	130	5664.71	Nb I
40	5618.81	Eu I	100 h	5632.97	Si II	7	5648.991	Th I	5	5664.842	Ge I
23	5619.38	Mo I	11 h	5633.03	Pr I	150	5649.26	Te II	9	5664.89	Lu II
27	5619.44	Pd I	10	5633.90	V I	12 h	5649.37	Cr I	130	5664.90	Ta I
10	5620.04	Ir I	50	5634.86	Mo I	7	5649.56	Ru I	70	5664.95	Er I
11	5620.06	Pr II	11	5635.212	Cs I	55	5649.56	Sc I	11	5665.20	Ru I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
45	5665.44	Er II	12	5682.20	Ni I		5698.03	Nb I	65	5711.88	Ti I
80	5665.554	Si I	7 h	5682.48	Cr I	40	5698.33	Cr I	10	5711.90	Ni I
170	5665.63	Nb I	5	5682.633	Na I	1200	5698.52	V I	10000	5712.39	Pu I
100	5666.20	Te II	35	5682.89	Mo I	28	5698.72	Dy II	12	5712.64	Cr I
20	5666.28	Zr I	20	5683.22	V I	180	5699.05	Ru I	24	5712.78	Cr I
650	5666.63	N II	14	5683.59	Tm I	3000 d	5699.15	Rb II	25	5713.28	Hf I
17	5666.86	Nb I	95	5684.20	Sc II	370	5699.23	Ce I	14	5713.49	Lu II
15	5667.128	Th I	27	5684.24	Eu I	40	5699.24	Ta I	22	5713.83	Pr II
55	5667.16	Sc II	120	5684.484	Si I	23	5699.28	Mo I	40 h	5713.92	Ti I
100	5667.34	Ag I	40	5684.76	Tm II	200	5699.61	Xe II	10	5715.09	Ni I
40	5667.53	F I	10	5685.192	Th I	1100	5700.21	Sc I	95	5715.13	Ti I
600	5667.56	Xe II	15	5685.42	Zr I	1500	5700.24	Cu I	30	5715.24	Ta I
100	5667.88	Re I	24	5685.58	Dy I	25	5700.82	F I	17	5715.59	Nb I
110	5668.36	V I	13	5685.60	Pr II	65	5700.918	Th II	22	5715.79	Tm I
65 c	5668.46	Pr I	29 c	5685.74	Tb II	90	5701.105	Si I	16	5716.08	Pr II
70	5668.87	Nd II	450	5686.21	N II	95	5701.35	Gd I	200	5716.10	Xe II
70	5669.04	Sc II	40	5686.38	Rh I	200 h	5701.37	Si II	11 h	5716.21	V I
45	5669.55	Pr II	40 c	5686.48	Tb I	30	5701.57	Nd I	8	5716.29	Si III
1000 h	5669.56	Si II	16	5686.52	Pr I	6	5701.776	Ge I	65	5716.35	Nb I
65	5669.77	Nd I	7	5686.53	Yb II	500	5702.05	I II	55	5716.48	Ti I
240	5669.96	Ce I	1200	5686.84	Sc I	75	5702.12	Cu III	8	5716.53	Ta I
35	5669.99	Pr II	22 h	5687.17	Pr II	10000	5702.24	Bk I	18	5716.95	Re I
75	5670.07	Pd I	200	5687.30	Tc I	130	5702.24	Nd II	230	5717.28	Sc I
310	5670.85	V I	9	5688.204	Na I	24	5702.31	Cr I	1	5717.3	Sb III
150	5670.91	Xe II	30	5688.25	Ta I	9 h	5702.47	Rh I	55	5717.48	Er I
65cw	5671.02	Nb I	65	5688.44	Pr II	75	5702.68	Ti I	5	5717.877	Ge I
100	5671.12	Mn III	220	5688.53	Nd II	24	5702.91	Dy I	80	5718.12	Nd II
90	5671.67	F I	300 h	5688.81	Si II	920	5703.56	V I	75bl	5718.21	ZrO
1500	5671.81	Sc I	200	5689.05	Tc I	15	5704.31	Ta I	70 h	5718.46	Dy I
70 c	5671.84	Ho	18	5689.14	F I	22	5704.38	Pr I	300	5718.71	Br II
85	5671.91	Nb I	460	5689.14	Mo I	7	5704.60	Si III	240	5719.03	Ce I
60	5672.15	Tc I	22	5689.21	Pr II	80	5705.72	Mo I	45	5719.08	Pr II
21	5673.42	Ti I	95	5689.47	Ti I	160	5706.1	S I	160	5719.18	Hf I
23	5673.63	Mo I	23	5689.51	Nd I	40	5706.16	Nb I	40 h	5719.2	Bi II
60	5673.85	Eu I	30	5689.72	Sr III	85	5706.20	Sm I	5	5719.225	Ne I
16	5674.14	Pr II	11	5690.14	Pd I	80	5706.21	Nd II	70	5719.55	Er I
7	5674.38	Os I	200 h	5690.35	Kr II	25	5706.28	Ta I	45 d	5719.63	Pr II
27	5674.39	W I	100	5690.425	Si I	100 h	5706.37	Si II		5719.80	Pr II
55	5674.47	Mo I	1	5690.8	Sb III	85	5706.48	Nb I	7	5719.82	Cr I
65	5674.70	Ho I	2000 c	5690.91	I II	160	5706.73	Y I	11	5719.88	Fe III
90	5675.27	Y I	55 h	5690.97	Pr II	10	5706.82	Sc IV	220	5719.99	Yb I
130	5675.44	Ti I	500	5691.08	Ce III	570	5706.98	V I	25bl	5720.16	HfO
55	5675.48	Er I	140 c	5691.47	Ho I	95	5707.103	Th II	50	5720.183	Th I
520	5675.84	Tm I	9	5691.954	Ge I	25	5707.31	F I	35	5720.48	Ti I
160	5675.86	Hg I	40	5692.346	Pb I	65	5707.61	Pr I	24	5720.61	Y I
160	5675.922	Hg I	120	5692.94	Ce I	200	5708.12	Te II	100 h	5721.36	Au I
140 d	5675.97	Nd I	25	5693.09	Nb I	35	5708.23	Ti I	100 c	5721.80	In II
550	5676.02	N II	18	5693.63	Y I	160	5708.28	Nd II	170	5721.93	Os I
55	5676.33	Nd I	28 h	5693.67	DyO	160	5708.397	Si I	6	5722.58	Rn I
13	5676.60	W I	24 h	5694.10	DyO	160 c	5708.50	In II	1000	5722.73	Al III
15	5676.90	W I	28cw	5694.54	DyO	190	5708.61	Sc I	210	5722.74	Mo I
16	5677.03	Pr II	24	5694.73	Cr I	30	5708.89	Zr I	40	5723.17	In III
20	5677.053	Th I	8	5695.00	Ni I	11	5708.95	V I		5723.70	Sr II
25	5677.47	Nb I	55 h	5695.09	Pd I	29	5709.33	Nb I	180	5724.08	Sc I
120	5677.75	Ce I	14	5695.53	Er II	11	5709.37	Os I	60	5724.121	Rb I
40	5677.89	Mo I	6	5695.71	Hg III	65	5709.42	Gd I	3	5724.614	Rb I
1000	5678.08	I II	100	5695.75	Xe I	23	5709.56	Ni I	13	5724.82	Ru I
870	5679.56	N II	22	5695.90	Pr II	50	5709.91	In I	700	5725.31	Tc I
16	5679.63	Ru I	450	5695.92	C III	35	5709.97	Tm II	70	5725.64	V I
30 h	5679.94	Ti I	390	5696.22	Gd I	4000 c	5710.53	I II	25	5725.66	Nb I
10	5680.18	Ba I	70bs	5696.3	HoO	300	5710.59	Ce III	13	5725.73	Ru I
28	5680.88	Os I	14	5696.42	Tm II	450	5710.77	N II	28 h	5725.84	DyO
55bl	5680.89	GdO	140 c	5696.57	Ho I	27	5710.87	Er II	10000	5726.05	Cf I
120	5680.90	Zr I	1200	5696.60	Al III	35	5710.93	Sm I	65	5726.83	Nd II
27	5681.10	Eu I	120	5696.73	Sm I	30	5711.09	Mg I	500	5726.91	Xe II
7 h	5681.20	Cr I	300	5696.99	Ce I	25	5711.43	Re I	55	5726.97	Er I
30 h	5681.44	Si II	15	5697.79	W I	40	5711.63	Pr II	850	5727.03	V I
400	5681.89	Kr II	35 d	5697.90	Nb I	880	5711.75	Sc I	6	5727.30	Rh I
55	5681.89	Pr II	40bl	5698.03	HfO	23	5711.80	Mo I	170	5727.66	V I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
50	5727.68	In I	8	5745.724	Cs I	160	5761.84	La I	60	5778.33	Sm I
100	5727.71	P II	16	5745.99	Ru I	40 h	5762.27	Ti I	17bl	5778.57	ZrO
11	5728.38	Pr I	85	5746.36	Gd I	24	5762.66	Tb I	5	5778.82	Tm II
55 h	5728.64	DyO	7	5746.43	Cr I	290	5762.80	Er I	45	5779.24	Sm I
23	5728.77	Mo I	23	5746.71	Ta I	45	5762.977	Si I	90	5779.28	Pr I
75	5728.89	Y II	18bl	5746.93	YO	20	5762.990	Fe I	40	5779.36	Mo I
130	5729.19	Nb I	20	5747.13	Pr II	6	5763.57	Pt I	3	5779.41	Pb III
100	5729.29	Nd I	285	5747.30	N II	24bl	5764.22	YO	25	5780.02	Ta I
26 d	5729.45	Mo I	16	5747.47	Ru I	190	5764.29	Tm I	7	5780.19	Mn I
	5729.59	Mo I	85 c	5747.58	Tb I	1000 d	5764.33	I I	17	5780.34	Nb I
150bl	5730.12	YO	45	5747.667	Si I	80	5764.419	Ne I	70	5780.384	Si I
200	5730.81	Pm I	17	5747.70	V I	55bl	5764.45	ScO	70	5780.59	U I
60	5730.87	Eu I	11	5747.74	Pr I	240	5764.75	N I	90	5780.71	Ta I
230	5731.25	V I	11	5747.95	Pr II	65	5764.99	Nb I	30	5780.78	Ti I
40	5731.88	Pr II	35bl	5748.17	ZrO	22	5765.05	Os I	170	5780.82	Os I
300 l	5732.05	Ac II	12	5748.298	Ne I	330	5765.20	Eu I	12 h	5781.20	Cr I
21	5732.09	Y I	60	5748.65	Er I	600	5765.27	Pr III	100	5781.69	Y II
50	5732.95	Sm I	5	5748.71	Lu III	75	5765.64	Y I	6 h	5781.81	Cr I
30	5732.975	Th II	12	5748.72	Hf I	55 h	5766.35	Ti I	45	5781.93	Sm II
22	5733.43	Er II	40	5748.87	V I	25	5766.56	Ta I	1500	5782.13	Cu I
7	5733.5	Te I	55	5749.19	Nd I	30	5766.64	Ho	19	5782.36	Tm II
14	5733.81	Tm II	13	5749.24	W I	14	5767.18	Hf II	16	5782.38	K I
120	5733.86	Gd II	30	5749.388	Th II	23	5767.33	Nd I	11	5782.61	V I
40	5734.01	V I	500	5749.47	Ce III	30 c	5767.91	Ta I	45	5782.82	Er I
27	5734.02	Ho I	22	5749.58	Ho I	11	5767.92	Ru I	24 h	5783.11	Cr I
23	5734.55	Nd	27	5749.66	Nd I	200	5768.16	Pm II	23 h	5783.33	Mo I
55	5735.09	W I	10	5749.91	Yb II	100	5768.56	Cu III	11	5783.50	V I
120	5735.70	Zr I	24	5750.48	Dy I	160	5769.07	La II	11	5783.63	Fe II
45	5736.4	HoO	500	5751.03	Xe II	22	5769.16	Pr II	180	5783.69	Eu I
550	5736.55	Lu I	620	5751.40	Mo I	370	5769.34	La I	30 h	5783.93	Cr I
22	5736.56	Er I	85	5751.44	Nb I	240	5769.598	Hg I	800	5784.18	Ba II
18	5736.61	Pd I	11	5752.02	Ru I	240	5769.60	Hg I	40 h	5784.38	V I
55bl	5736.85	ScO	700	5752.50	N I	16	5769.79	Pr II	300 l	5784.39	Np I
22	5736.94	Er I	55	5752.53	Er I	70	5769.92	Er I	22	5784.46	Tm II
230	5737.06	V I	17	5752.74	V I	10000	5770.26	Pu I	70	5784.66	Er I
11 d	5737.20	Tm II	21	5752.84	Ti I	29	5771.08	Nb I	45	5784.96	Nd I
	5737.25	Tm II	110 c	5752.93	Re I	500 c	5771.47	Tc I	24 h	5785.00	Cr I
21	5737.36	Nb I	22	5753.02	Pr II	14	5771.63	Sc IV	24	5785.18	Tb II
8	5737.89	Os I	140	5753.17	F III	27	5771.66	Yb II	65 c	5785.28	Pr II
13	5738.20	Nb I	15	5753.59	Sn I	10	5771.93	Ta I	5	5785.31	Mg I
1000	5738.27	I II	45	5753.625	Si I	4	5772.10	Zn I	4	5785.56	Mg I
7	5738.29	Mn I	7	5753.69	Cr I	70	5772.145	Si I	30 h	5785.73	Si II
24 h	5738.73	DyO	85 d	5754.17	Gd I	4	5772.32	K II	19 h	5785.82	Cr I
14 h	5738.92	Tm II	45	5754.220	Si I	70	5772.42	V I	75 h	5785.98	Ti I
60	5739.00	Eu I	16	5754.68	Ni I	95bl	5772.74	ScO	55 h	5786.16	V I
100	5739.19	Er I	30	5755.81	Ta I	140	5773.12	Ce I	65	5786.17	Pr II
55	5739.24	Ho I	150	5755.85	Te II	45	5773.16	Pr II	70	5786.46	Lu III
85	5739.51	Ti I	10 h	5755.89	Yb I	70	5773.77	Sm I	1800	5786.96	Gd III
10	5739.520	Ar I	11	5756.10	W I	15	5773.946	Th I	70 d	5786.98	Sm II
200	5739.64	Rb II	90	5756.17	Pr II	35	5773.95	Y I	500	5787.02	I II
8	5739.72	Os I	10	5756.38	Fe III	75 h	5774.05	Ti I	85	5787.54	Nb I
20	5739.73	Si III	11	5756.83	Ru I	23	5774.55	Mo I	60 h	5787.99	Cr I
40	5740.02	Ti I	19	5756.86	Ti I	500 c	5774.83	I II	120	5788.15	Ce I
50	5740.20	Dy I	70	5757.63	Er II	55bl	5775.32	ScO	45	5788.22	Nd I
35	5740.61	Er I	27	5758.02	Tm I	55	5775.40	Lu I	16 h	5788.29	Pr II
180	5740.66	La I	300	5758.65	Xe II	4	5775.50	Zn I	60	5788.38	Sm I
15	5740.83	Yb III	24	5758.79	Dy I	11	5775.91	Pr II	23	5788.56	V I
70	5740.86	Nd II	400	5758.97	Ac II	75	5776.02	Gd I	16	5788.92	Pr II
19	5741.22	Ti I	16	5759.40	Pr II	50 c	5776.07	Nb I	8	5789.1	Te I
24	5742.084	Th II	45	5759.52	Sm II	45	5776.12	Nd I	320	5789.24	La I
6	5742.55	Bi I	22	5760.20	Pr I	300	5776.39	Xe II	20	5789.645	Th I
50	5743.35	Sm II	55	5760.20	Tm I	35	5776.64	V I	100	5789.66	Hg I
110	5743.45	V I	110	5760.34	Nb I	130	5776.77	Ta I	17	5789.79	Nb I
90	5743.85	Y I	70	5760.551	Th I	110cw	5776.83	Re I	280	5790.66	Hg I
1	5744.09	La III	1000	5760.72	I II	200	5776.99	Pm I	280	5790.663	Hg I
9	5744.19	Fe III	8	5760.85	Ni I	10	5777.11	Zn I	16	5790.86	Pr II
160	5744.41	La I	120	5761.20	F III	16	5777.29	Pr II	180 h	5791.00	Cr I
300	5744.85	Po I	17	5761.41	V I	400	5777.62	Ba I	22	5791.15	Er II
55	5745.53	Dy I	15 h	5761.61	Ta I	200	5778.14	La III	450	5791.34	La I

ntensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
45	5791.36	Pr II	70bl	5809.84	ScO	60 h	5830.34	Sb I	50	5846.13	Si II
240	5791.38	Gd I	40	5810.58	Pr II	55 h	5830.72	V I	85 h	5846.30	V I
18	5791.60	Re I	130	5811.10	Ta I	300	5830.78	Br II	65	5847.13	Pr II
520	5791.85	Mo I	14	5811.19	Tm II	45	5830.94	Pr II	30	5847.32	Zr I
29	5792.66	Rh I	80	5811.57	Nd II	600cw	5830.98	Eu I	95bl	5847.73	ScO
15	5792.72	Eu I	70bl	5811.60	ScO	45	5831.02	Sm II	19	5847.77	Hf I
22	5792.95	Pr I	200	5811.98	C IV	500	5831.16	Cs II	40 h	5848.05	DyO
13	5793.06	W I	15	5812.15	K I	200	5831.48	Tc I	20	5848.25	Ga III
90	5793.071	Si I	120	5812.92	Ce I	35	5831.58	Rh I	9	5848.76	Fe III
50	5794.24	Nb I	2	5813.45	La III	17	5831.89	K I	20 h	5848.86	Mo I
100	5794.65	Tc I	16	5813.55	Pr II	80 h	5832.01	DyO	70bl	5849.07	ScO
30 h	5794.90	Si II	20	5813.63	Ra II	21	5832.27	Y I	45 b	5849.4	HoO
75	5795.64	Tb I	45	5813.89	Nd I	10	5832.370	Th I	13	5849.68	Ta I
23 h	5795.77	Mo I	350	5814.18	Cs II	100	5832.855	Kr I	55 h	5849.73	Mo I
9	5795.79	Rh I	100 c	5814.24	Tc I	16 h	5833.21	Ru I	100	5850.07	Er I
50 d	5796.305	Cl I	45	5814.89	Sm I	100	5833.515	Cu II	11	5850.32	V I
13	5796.49	W I	21bl	5814.96	TiO	13	5833.61	W I	65 c	5850.64	Pr II
65 h	5796.80	Gd I	65	5814.98	Ru I	55 h	5833.85	DyO	100	5850.72	Cu III
1	5797.20	Sn II	160 d	5815.17	Pr II	18	5833.93	Fe III	65	5851.07	Tb I
220	5797.58	La II	29 h	5815.33	Nb I	35	5833.99	Yb II	50 h	5851.52	Mo I
160	5797.74	Zr I		5815.33	Pr II	5	5834.263	Ar I	28	5851.58	W I
100	5797.859	Si I	65	5815.36	Tb I	550	5834.31	Re I	220	5851.63	Gd I
70	5798.53	U II	19	5815.422	Th II	40 h	5834.86	DyO	1800	5852.08	Br I
15	5799.18	Sn II	55	5815.85	Gd II	75	5834.90	Nb I	21	5852.34	Ti
80 c	5799.85	Tc I	10 c	5815.92	Re I	40	5835.13	Pr I	500	5852.488	Ne I
45	5799.914	Cl I	100	5815.96	Xe II	23	5835.59	Mo I	45	5852.63	Pr II
11	5799.97	Tm II	14 h	5816.46	Tm I	45	5835.84	Er I	210 c	5853.15	In II
15bl	5800.00	YO	25	5816.51	Ta I	45	5836.02	U I	110	5853.62	Al II
45	5800.09	Nd I	7	5816.84	Mn I	150 c	5836.33	Tc I	2800	5853.68	Ba II
100	5800.23	Ba I	23	5817.06	V I	45	5836.37	Sm II	235	5854.04	N I
60	5800.27	Eu I	10	5817.44	Ti III	35	5837.14	Yb II	15	5854.121	Th I
26	5800.46	Mo I	19	5817.47	Hf I	300	5837.37	Au I	11 c	5854.44	Pr I
150 h	5800.47	Si II	35 h	5817.53	V I	55	5837.68	U II	27	5854.51	Yb I
60	5800.52	Sm I	12	5818.3	Bi II	9 b	5838.07	YO	10	5854.62	Fe III
80	5800.59	Lu I	55	5818.57	Pr II	25	5838.15	Nb I	55	5855.24	Gd II
40	5800.60	Os I	15bl	5818.58	YO	130 d	5838.64	Nb I	120	5855.31	Er I
70	5800.79	Er I	170	5818.74	Eu II	35	5838.76	Tm II	40	5855.56	DyO
6	5801.029	Ge I		5819.00	Sr II	5 c	5838.835	Cs I	45	5856.07	Pr II
250	5801.33	C IV	45 b	5819.2	HoO	13	5838.97	W I	280	5856.22	Gd I
17	5801.75	K I	450	5819.2	S II	10000	5839.05	Pu I	11	5856.61	W I
9	5802.093	Ge I	10	5819.41	Yb II	22	5839.47	Ho I	30	5856.742	Cl I
35	5802.67	Mo I	110	5819.43	Nb I	10	5839.82	Mg III	55	5856.90	Pr II
65	5802.84	Sm I	100	5819.50	In III	20	5839.99	Mo I	30	5857.45	Ca I
55	5802.92	Gd I	65hs	5819.51	GdO	20	5840.12	Pt I	10	5857.76	Ni I
75	5803.13	Tb II	40	5820.156	Ne I	55	5840.47	Gd II	110	5857.76	Os I
9	5803.34	Rh I	27	5820.37	Nd I	21 h	5841.18	Ti	6	5857.96	Pb III
10	5803.44	Yb I	35	5820.62	Nb I	25	5842.23	Hf II	520	5858.27	Mo I
140	5803.78	Hg I	40	5820.62	Pr II	80	5842.39	Nd II	15	5858.83	YO
27 b	5803.8	HoO	16 h	5821.36	Pr I	50	5842.47	Nb I	55	5858.91	Nd I
160	5804.02	Nd II	6	5821.84	Rh I	8	5842.49	Os I	60	5859.25	Hg I
50	5804.03	Nb I	30	5821.87	Y I	29	5842.97	Tb I	90	5859.68	Pr II
35	5804.141	Th I	27 h	5821.90	Ho I	40	5843.30	Cd II	20	5860.2	Bi II
65hl	5804.26	Ti I	140	5821.99	La I	45 c	5843.94	Ta I	140 c	5860.28	Ho I
16	5804.39	Ru I	55	5822.59	Pr II	28 h	5844.41	DyO	10	5860.310	Ar I
12	5804.450	Ne I	40	5823.71	Ti I	1500	5844.41	Pr III	28	5860.64	Os I
45	5804.85	W I	90	5823.72	Pr II	35 c	5844.65	Pr II	55	5860.73	Gd II
20	5805.69	Ba I	300	5823.89	Xe I	30	5844.66	Nd I	35	5860.78	Sm I
160	5805.78	La II	500	5823.93	Pm II	8	5844.84	Pt I	40 h	5860.79	Lu I
150	5805.989	Cu II	150	5824.80	Xe I	40	5844.98	Pr II	27	5860.97	Eu I
13 d	5806.05	W I	23	5825.20	Mo I	30	5845.141	Cs I	20	5861.38	Mo I
22	5806.10	Er I	70	5825.87	Nd II	17	5845.27	W I	1500	5862.09	Gd III
	5806.24	W I	150	5826.28	Ba I	3	5845.5	Sb III	30	5862.353	Fe I
200	5806.74	Si II	150	5826.42	C III	24	5845.65	DyO	100 h	5862.93	Au I
40	5806.91	Rh I	30	5826.74	Nd I	27	5845.77	Eu I	27 h	5864.42	Ho I
35 h	5807.14	V I	430	5826.79	Er I	25	5845.87	Hf I	22	5864.63	W I
55hs	5807.72	Gd I	30	5827.80	Si II	10	5845.919	Th I	15	5864.77	Eu I
10	5808.28	Ga III	8	5828.06	Ru I	23	5845.95	Nd I	285	5866.3	Se II
55 h	5809.22	Gd I	10	5828.55	Ir I	10000	5846.07	Cm I	9	5866.30	Lu I
12	5809.50	Hf II	265	5829.54	N I	17	5846.09	Nb I	400	5866.46	Ti I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
65	5866.47	Nb I	15	5885.96	Ti IV	11	5903.98	Os I	15	5925.90	Ta I
15	5866.61	Ta I	23	5886.24	Nd I	55	5904.07	Gd II	200	5926.29	Tc I
35	5867.08	Nd I	27	5886.30	Er II	22	5904.29	Ho I	40 h	5926.36	Mo I
10	5867.48	Si II	55	5886.46	Gd I	45	5904.45	Pr II	15	5926.47	Hf I
65	5867.79	Sm I	7	5887.36	Ir I	110	5904.56	Gd I	27	5926.52	Eu I
55 h	5868.11	Dy II	70 b	5887.38	ScO	250	5904.71	Pm I	21	5926.87	Ru I
50	5868.27	Zr I	30	5887.91	Nd I	35	5904.71	Tb I	250 c	5927.17	Pm II
15	5868.373	Th I	820	5888.33	Mo I	200	5905.13	Xe II	29	5927.41	Nb I
300 h	5868.40	Si II	25	5888.584	Ar I	100	5905.90	Pm I	5	5927.8	Tl III
45	5868.61	Sm I	55	5888.62	La III	55	5906.06	Er I	360	5927.81	N II
300 c	5868.79	Pm II	21 h	5888.68	Ti	60	5906.429	Ne I	60bl	5928.10	ScO
80	5868.83	Pr II	60	5889.76	Lu III	11	5906.84	Os I	13	5928.58	W I
30	5868.90	Nd I	570	5889.77	C II	7	5907.31	Rh I	15	5928.813	Ar I
50	5869.33	Mo I	32	5889.950	Na I	15	5907.64	Ba I	160 h	5928.88	Mo I
110	5869.50	Zr I	7	5891.15	Ti IV	20	5908.36	Yb II	18 p	5929.69	Fe III
80	5869.71	Lu III	8	5891.451	Th I	30bl	5908.61	ZrO	85	5930.29	Gd I
65	5870.62	Tb I	350	5891.59	C II	40	5908.67	Pr II	320	5930.62	La I
45	5870.85	Ho I	13	5891.61	W I	7	5908.95	Os I	15	5930.62	Ta I
3000	5870.914	Kr I	15	5891.91	Fe III	45	5909.24	Er I	40	5930.66	Pr II
27	5871.04	Nd I	55	5892.23	Pr II	12	5909.94	Eu I	23	5931.05	Ta I
35	5871.06	Sm I	23	5892.29	Mo I	10000	5910.71	Bk I	24 b	5931.10	YO
60	5871.73	Hg II	35 c	5892.56	Ho I	1000	5910.85	Ac II	20	5931.68	Ta I
15	5871.83	Y I	10	5892.88	Ni I	170	5911.45	Gd II	11	5931.70	Tm I
20	5871.98	Hg I	300	5893.29	Xe II	50	5912.085	Ar I	550	5931.78	N II
140	5872.35	Er I	50 h	5893.38	Mo I	24 b	5912.19	YO	600 c	5931.93	Tc I
100	5872.828	Ne I	1000	5893.389	Ge II	8	5912.58	Tm I	26	5932.38	Ru I
90	5872.98	Eu II	40	5893.44	Nb I	65	5913.55	Gd II	3	5932.71	La III
40	5873.764	Si I	24 b	5893.94	YO	30	5914.114	Fe I	35	5933.50	Er I
22	5873.83	Pr II	2000	5894.03	I I	20	5914.387	Th II	60	5933.69	Hf I
50	5874.21	Sm I	35	5894.06	Ir I	2	5914.54	Pb IV	30 c	5933.71	Ho I
11	5874.22	W I	22	5894.22	Pr II	125	5914.96	Pm I	40 c	5934.16	Nb I
35	5874.70	Nb I	500	5894.33	Zn II	40	5915.16	Dy II	100	5934.17	Xe I
35	5874.72	Pr I	100	5894.99	Xe I	150	5915.22	Si II	100	5935.20	Zr I
100	5875.02	Xe I	15	5895.09	Sb II	11	5915.31	Pr I	18	5935.54	Ta I
200 c	5875.31	Pm II	15	5895.31	Eu I	230	5915.39	U I	27	5935.90	Tm I
500	5875.62	He I	200	5895.624	Pb I	260 w	5915.4	In II	50	5936.15	Te II
3	5875.63	La III	240	5895.63	Tm I	75	5915.74	Eu I	16	5936.33	Pr II
100	5875.97	He I	16	5895.924	Na I	11	5915.97	Pr I	8	5936.65	Ru I
24	5876.14	YO	8	5897.21	Yb II	7	5916.43	Mg II	85	5936.84	Gd I
9	5876.26	Fe III	45	5897.39	Sm II	30	5916.51	Ta I	10	5937.162	Th I
26	5876.59	Mo I	200	5897.971	Cu II	55	5916.77	Gd I	120	5937.577	Cu II
65	5877.26	Gd II	9	5898.68	Fe III	35bl	5918.04	ScO	65	5937.71	Gd I
240	5877.36	Ta I	20	5898.78	Mo I	6	5918.16	Mg II	75	5937.82	Ti I
17	5877.79	Nb I	10 h	5898.79	Si III	9	5918.54	Rh I	35	5938.90	Sm II
14	5877.79	Ti IV		5898.82	Mo I	120	5918.55	Ti I	90bl	5939.08	YO
300 l	5878.04	Np I	35	5898.84	Tb I	120 c	5918.78	In II	50 c	5939.38	Tb I
35	5878.10	Pr I	50	5898.96	Sm I	90	5918.95	Ta I	150	5939.66	Pm I
100 c	5878.76	Pm II	230	5899.32	Ti I	9	5918.96	Fe III	130	5939.76	Ta I
10	5878.933	Th I	35	5899.47	Tm I	30	5919.11	Sc I	160	5939.90	Pr II
35	5879.04	Pr I	150	5899.76	Pm II	55	5919.34	Ru I	40 h	5940.12	V IV
80	5879.25	Pr II	15	5899.844	Th I	10	5919.86	Re I	35	5940.17	Tb I
27 b	5879.6	HoO	190cw	5900.62	Nb I	10 p	5920.13	Fe III	285	5940.24	N II
340	5879.80	Zr I	50	5901.09	Zr I	40	5920.76	Pr I	1600	5940.48	Br I
24	5879.96	Y I	13	5901.20	W I	65 c	5920.78	Tb I	65	5940.72	Pr II
13	5880.21	W I	40	5901.47	Mo I	27	5921.22	Nd I	230	5940.86	Ce I
50	5880.22	Cd II	24	5901.57	Tm I	80	5921.45	Ru I	55 h	5940.95	GdO
65	5880.31	Ti I	90	5901.91	Ta I	70	5921.76	Ho I	400	5941.196	Cu II
120	5881.14	Er I	27	5902.08	Er II	150	5922.12	Ti I	7	5941.46	Rh I
100	5881.895	Ne I	24	5902.40	Tb I	10	5922.72	Ca II	650	5941.65	N II
10	5882.30	Ir I	60	5902.462	Ne I	150	5923.36	Tc I	22	5941.65	Pr I
130	5882.30	Ta I	40	5902.64	W I	10	5923.69	Ca II	120	5941.76	Ti I
15	5882.624	Ar I	16	5902.82	Fe II	1000 c	5924.47	Tc I	5	5942.669	Ar I
11	5882.92	Os I	35	5902.96	Y I	20	5924.56	Dy II	45	5942.72	Eu I
70 c	5882.99	Ho I	27	5902.97	Eu I	40	5924.57	V I	55 h	5942.78	GdO
30	5883.29	Nd I	40	5903.11	Pr II	140	5925.13	Zr I	60	5943.24	Re I
22	5883.66	Hf I	8000	5903.30	Er III	12	5925.30	Eu I	240	5944.02	Ta I
35 c	5884.72	Pr I	55	5903.33	Ti I	50	5925.44	Sn I	10	5944.648	Th I
13	5885.02	Fe II	490 w	5903.4	In II	500	5925.65	Cs II	100	5944.834	Ne I
85	5885.62	Zr I	40 c	5903.80	Nb I	19	5925.893	Th II	500	5945.53	Xe II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
45	5945.72	Y I	70	5965.28	F I	150	5983.22	Nb I	300	5999.85	Ba II
70	5945.80	Dy I	100	5965.471	Ne I	11	5983.22	Os I	650	6000.120	Cu II
22	5946.37	Er I	13	5965.63	Fe II	10000	5983.35	Pu I	11	6000.18	Ce I
400 c	5946.49	Pm II	65	5965.71	Sm II	1000	5983.40	Ce III	65	6000.96	GdO
200	5946.65	Mn III	200	5965.84	Ti I	130	5983.60	Rh I	50	6001.05	Zr I
35	5947.16	Pr II	55	5965.86	W I	27	5983.78	Eu I	200	6001.13	C I
55	5947.57	W I	330	5966.07	Eu II	20	5983.82	W I	290	6001.76	Al II
200	5947.98	Pr III	480cw	5967.10	Eu I	690cw	5983.9	Lu II	2000	6001.862	Pb I
70cw	5948.03	Ho I	75	5967.34	Tb II	100	5984.23	Zr I	75 h	6001.87	GdO
200	5948.545	Si I	110	5967.82	Pr II	35	5984.29	Sm I	220	6001.88	Al II
100 d	5948.58	Cl I	400	5967.89	Pm I	200	5984.82	Pm I	55	6001.90	Ce I
10 d	5949.02	Yb III	60bl	5968.25	ScO	24	5984.86	Dy I	55	6002.04	Ho I
25	5949.48	Tl II	15 h	5968.43	Eu I	300	5984.86	I I	28	6002.31	V I
22 c	5949.76	Pr I	9	5968.48	Fe III	11	5984.87	Tm I	29	6002.44	Pr II
500	5949.83	Ce III	55	5968.68	Er I	65	5986.08	Nb I	3000	6002.63	Ce III
24	5950.02	Y I	35 h	5968.82	Sm II	40	5986.14	Pr I	55	6002.63	V I
12	5950.15	F I	35	5969.19	Sc I	30	5986.956	Fe I	740bl	6003.60	YO
10	5950.21	Re I	2	5969.64	K II	100 c	5987.13	Pm II	60	6004.36	Eu I
5000	5950.25	I II	18 h	5969.77	Re I	45 c	5987.14	Pr I	1400	6004.52	Lu I
8	5951.15	Ru I	200 h	5970.10	Sr I		5987.29	Pr II	55	6004.57	Gd II
24	5951.17	Tb I	100	5970.30	Sn I	7	5987.302	Ar I	120	6004.65	Y
55	5951.27	Pr II	300	5971.13	Xe II	1000bl	5987.64	YO	100	6005.21	Sb II
55	5951.60	Gd II	140	5971.26	Tm I	1500	5987.85	Gd III	27	6005.33	Ho I
20	5951.76	Pr II	55	5971.50	U I	80	5987.907	Ne I	15 h	6005.61	Eu I
25	5951.78	Ta I	30	5971.69	Eu I	110 h	5988.02	Gd I	24 h	6005.75	DyO
10	5952.31	Fe III	100	5971.70	Ba I	40	5988.17	Mo I	55	6005.86	Ce I
285	5952.39	N II	220	5971.94	Al II	90	5988.42	Sc I	250	6006.03	C I
10000	5952.41	Cm I	1300bl	5972.04	YO	140	5988.56	Dy I	15	6006.20	Ce I
300	5953.17	Ti I	27	5972.51	W I	16	5988.67	Ru I	90	6006.33	Pr II
27	5953.49	Eu I	170	5972.75	Eu I	85	5989.044	Th II	450	6006.42	Al II
14	5953.62	Fe III	70	5972.76	Ho I	12 h	5989.08	Fe III	24 h	6006.54	DyO
27	5953.84	Eu II	20	5973.0	Bi II	17	5989.33	Yb I	35	6006.79	Er II
13	5953.96	W I	20	5973.05	Yb III	150	5989.774	P IV	55	6006.82	Ce I
30	5954.28	Eu I	21 h	5973.38	Ru I	10	5989.99	Re I	24 h	6006.97	DyO
110	5955.35	Zr I	90	5973.52	Ho I	9	5991.19	Rh I	21	6007.072	Th I
14	5955.70	Fe II	30	5973.665	Th I	13	5991.27	Pr I	110	6007.18	C I
27	5955.87	Nd I	8	5974.17	Ru I	40	5991.51	Yb II	19	6007.37	Ce I
45	5955.98	Ho I	75	5974.28	Hf I	17	5991.88	Co I	45	6007.67	Nd I
7000 w	5956.05	Pr III	120	5974.49	Dy I	200	5992.22	Kr II	210	6008.47	N I
13	5956.19	W I	100	5974.627	Ne I	240	5992.83	Eu I	13	6008.54	Pr I
75 b	5956.41	YO	100	5974.68	Te II	25	5992.96	Hf I	55	6008.71	Gd I
800	5956.42	Pm I	25	5974.72	Hf I	100	5993.260	Cu II	22	6008.75	Er II
55	5956.48	Gd II	27	5975.02	Tm I	15	5993.51	Ga III	200	6008.92	Xe II
90	5956.60	Pr II	27	5975.49	Er I	35	5993.65	Ru I	30	6008.94	Dy I
200	5956.69	Pm I	120	5975.534	Ne I	60	5993.849	Kr I	13	6009.01	W I
	5956.70	Pr I	100	5976.32	U I	24	5994.129	Th I	120	6009.19	Y I
300 h	5956.96	Au I	2000	5976.46	Xe II	50	5994.43	F I	9 c	6009.58	Pb II
500	5957.56	Si II	13 c	5976.95	Pr I	30	5994.76	Nd I	25 h	6009.89	Ta I
8	5957.587	Th I	85	5977.25	Gd I	13 c	5994.89	Pr I	80 c	6010.490	Cs I
40	5957.70	Nb I	30bl	5977.80	ZrO	80	5995.28	O I	150	6010.68	C I
160	5958.39	O I	270	5978.56	Ti I	17	5995.37	Zr I	65	6010.82	Dy I
190	5958.58	O I	60	5978.66	Hf I	18 h	5995.73	Re I	300 s	6011.22	Np I
25	5959.19	F I	20	5978.86	W I	65	5996.00	Os I	500	6011.667	Pb I
13	5959.25	Pr I	13	5978.88	Pr I	11	5996.06	Pr I	60 h	6012.20	Eu I
100 c	5960.08	Pm II	28	5978.91	V I	27	5996.47	Nd I	110	6012.56	Eu I
18	5960.13	Ta I	500	5978.93	Si II	100	5997.09	Ba I	21	6012.73	Ti
27	5960.83	W I	12	5979.32	Fe III	400	5997.12	Pm I	10000	6012.78	Pu I
35	5961.49	Sc I	400	5979.56	Ce III	140	5997.13	Lu I	55	6012.78	W I
18	5961.71	Fe II	200	5979.73	Pm I	190 c	5997.23	Ta I	300	6013.22	C I
20	5962.18	Pr I	15	5980.47	Eu I	45	5997.31	U I	75	6013.42	Ce I
2000	5962.22	Ce III	20	5980.78	V I	85cw	5997.93	Nb I	140	6013.50	Mn I
30	5962.4	Fe II	9 h	5981.01	Fe III	10	5998.00	Ba III	55	6014.83	Er I
30 h	5962.68	Au I	65	5981.19	Pr II	900 w	5998.94	Pr III	250	6014.84	C I
500	5962.71	Ce III	800	5981.25	Ba II	5	5998.999	Ar I	30	6015.426	Th II
28	5963.00	Pr I	7	5981.36	Os I	340	5999.04	Ti I	60	6015.58	Eu I
150	5963.00	Pm II	22	5981.43	Ho I	85	5999.08	Gd I	35	6015.74	Er II
90	5963.76	Eu I	50	5981.86	Y I	160	5999.43	N I	20	6015.79	Os I
50 l	5964.46	Dy I	230 c	5982.90	Ho I	18	5999.54	Fe III	150	6015.83	F I
200	5965.25	Cu III	27	5983.14	Eu I	65	5999.68	Ti I	25	6015.90	Ta I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
28	6016.12	V I	3000 l	6035.78	Pa I	45	6054.85	Er I	100	6074.338	Ne I
55	6016.48	Pr II	620bl	6036.17	ScO	200	6054.86	Sn =	2000 c	6074.98	I II
23	6016.59	Ce I	1000	6036.20	Xe II	440	6055.03	Lu I	90	6075.58	Eu I
200	6016.64	Mn I	13	6036.56	Fe III	140	6055.13	Pr I	40	6075.74	Pb II
45 c	6016.79	Hf I	500bl	6036.60	YO	110	6055.21	Al III	100	6076.40	Pm II
160bl	6017.07	ScO	10 h	6037.17	Kr III	250	6055.50	P II	60	6076.45	Er II
2	6017.11	La III	17	6037.698	Th I	20	6055.84	La III	35	6076.61	Ce I
24	6017.26	Dy I	150	6037.70	Sn I	40	6055.85	Yb III	30	6077.106	Th I
28	6017.38	U II	80	6038.04	F I	450	6056.0	Se II	17	6077.16	Ce I
150	6017.80	Pr II	16	6038.97	Ho I	300	6056.09	Np I	90	6077.29	U I
420	6018.15	Eu I	29	6038.97	Tb I	60	6056.125	Kr I	30	6077.38	Eu I
100	6019.47	Ba I	29	6039.38	Tb I	9	6056.36	Fe III	6	6077.48	Sn II
50	6019.812	Cl I	450	6039.73	V I	29	6056.65	Nb I	10 h	6078.38	Kr III
28 c	6019.85	Pr I	8 c	6041.17	Pb II	140	6057.36	Eu I	150	6078.39	Ge II
620bl	6019.87	YO	35 h	6041.66	Lu I	23	6057.50	Ce I	620bl	6079.30	ScO
100	6020.72	Ta I	24bl	6042.49	DyO	100	6057.86	P II	20	6079.58	Mo I
17	6021.036	Th I	35	6042.87	Pr II	35	6058.00	Ce I	5	6079.70	Sn II
500	6021.041	Ge II	500	6043.12	P II	100	6058.14	V I	30	6079.80	Sb II
28 b	6021.12	HfO	25 b	6043.19	HfO	24	6058.18	Dy I	300 s	6080.05	Np I
55	6021.13	Gd I	35	6043.223	Ar I	10000	6058.90	Cm I	20 h	6080.06	Si II
500	6021.18	Zn II	20	6043.31	W I	15	6059.1	Bi II	100	6080.11	F I
35	6021.43	Ho I	110	6043.39	Ce II	500	6059.356	Pb I	150	6080.343	Cu II
40	6021.52	W I	500	6043.39	Pm I	20	6059.372	Ar I	17	6080.37	Ce I
290	6021.80	Mn I	24	6044.431	Th II	45	6060.31	Ho I	110	6080.44	B II
70	6022.56	Er I	60	6044.66	Eu I	10000	6060.91	Ce III	55	6080.65	Gd II
60	6023.15	Eu I	50	6045.00	Sm I	150	6061.11	Al II	10	6081.27	Mo I
100	6023.264	Cu II	45	6045.39	Sm I	70	6061.25	Er I	17	6081.28	Ce I
120	6023.41	Y I	250	6045.39	Ta I	5	6061.536	Th I	40	6081.409	Pb II
2000 d	6024.08	I I	28	6045.42	Ce I	500	6061.79	Ce III	22	6081.44	W I
500	6024.18	P II	50	6045.50	Nb I	10	6061.92	Rn I	480	6081.44	V I
110	6024.20	Ce I	22	6045.63	Er II	140	6062.84	Zr I	120	6081.79	Ho I
5	6025.150	Ar I	170	6045.85	Zr I	130 c	6062.9	In II	1000	6082.43	I I
30	6025.36	Zr I	160	6046.23	O I	200	6063.12	Ba I	17	6082.44	Co I
20	6025.41	V I	190	6046.44	O I	490bl	6064.31	ScO	35	6082.61	Cl I
19	6025.44	Tm I	110	6046.49	O I	110	6064.63	Ti I	150	6083.409	P III
35	6025.49	Mo I	55	6046.66	Pr II	13	6065.08	W I	10 h	6083.78	Ag I
150	6025.72	Pr II	100	6047.25	Ta I	200	6065.09	Tc I	240	6083.84	Eu I
6	6026.04	Pt I	55	6047.40	Ce I	40	6065.482	Fe I	45	6084.12	Sm I
7	6026.10	Ir I	900	6047.54	F I	55	6066.03	Nd I	30	6085.06	Dy I
60	6026.18	Sc I	20	6047.83	Mo I	23	6066.75	Ce I	800	6085.23	Tc I
200	6027.11	Pm II	60	6047.99	Tc I	100 c	6067.00	Pm II	120	6085.23	Ti I
15	6027.16	Ce I	22	6048.14	Er II	45	6067.22	U II	200	6085.41	Pm II
16	6027.27	Mo I	11	6048.72	Fe III	20	6067.26	V I	13	6085.81	Pr I
20	6028.32	W I	25	6048.72	Nb I	13	6067.27	Pr II	28	6086.16	Pr II
170	6029.00	Eu I	100	6049.24	Zr I	10 h	6067.45	Si II	10 h	6086.67	Si II
50	6029.75	Nb I	35	6049.26	Pr I	11	6067.78	Tm II	30	6087.262	Th II
100	6029.997	Ne I	420	6049.51	Eu II	12	6067.83	Ir I	28	6087.34	U II
300	6030.06	Pm I	13	6049.92	W I	290	6068.43	Al II	65	6087.52	Pr II
1300	6030.66	Mo I	28	6050.04	Pr II	110	6068.53	Al II	350	6087.82	P II
24	6030.98	Dy I	27	6050.71	Ho I	500	6068.93	I II	50	6088.00	Y I
9	6031.02	Fe III	11	6050.88	Pr I	250	6069.00	Sn I	140	6088.26	Dy I
11	6031.26	Ce I	2000	6051.15	Xe II	500	6069.06	Pm I	19	6088.86	Ce I
35	6031.27	Nd II	55	6051.74	U II	19	6069.46	Ce I	19	6088.96	Ce I
400	6031.32	Pm I	19	6051.80	Ce II	35	6069.48	Ce I	210bl	6089.35	YO
50	6031.84	Nb I	150 c	6052.57	Pm II	13	6069.98	Ca III	9000 w	6090.02	Pr III
22	6032.12	Er II	450	6052.7	S I	50	6070.06	Sm I	1300	6090.22	V I
70	6032.127	Ar I	10	6052.723	Ar I	75	6070.755	Rb I	20	6090.38	Pr II
60	6032.36	Tc I	10	6052.88	Yb II	900	6071.09	Pr III	30	6090.82	Ta I
10000	6032.54	Ce III	1500 w	6053.01	Pr III	27	6071.70	Nd I	120	6091.17	Ti I
16	6032.59	Fe III	10	6053.381	Th I	35	6072.00	Ce I	35 h	6091.40	Sm I
85	6032.61	Zr I	20	6053.41	Sb II	250	6072.218	Cu II	150	6091.82	F III
27	6033.29	Nd I	25	6053.70	Ta I	440bl	6072.65	ScO	18	6092.06	Ta I
23	6033.58	Ce II	420bl	6053.81	YO	20	6072.713	Hg I	40	6092.81	Ti I
400	6034.04	P II	25	6054.17	Hf I	20	6072.72	Hg I	28	6093.09	Pr II
30	6034.089	Cs I	11	6054.18	Fe III	130bl	6072.78	YO	35	6093.19	Ce I
35	6034.20	Ce II	10	6054.57	Yb I	450	6073.23	Al II	600	6093.50	Xe II
45	6034.24	Nd II	7	6054.63	Os I	100	6073.46	Sn I	1900	6094.69	Cl II
23	6034.41	Ce I	10000 l	6054.64	Am I	300 s	6073.90	Np I	250 c	6095.95	In II
35	6035.49	Ce II	20	6054.81	Mo I	30	6073.97	Nd I	80	6096.163	Ne I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
18	6096.28	Pr I	6	6116.15	Rh I	11	6140.71	Lu I	13	6159.10	Pr II
160bl	6096.78	YO	18	6116.77	Ru I	35	6141.51	Pr II	100	6159.53	Pm II
500	6097.35	Ce III	22 c	6118.02	Pr I	20000	6141.72	Ba II	45 h	6159.56	Sm I
1500	6097.59	Xe II	15	6118.56	Ce I	120	6141.99	La III	30 c	6159.626	Rb I
150	6097.68	P I	120	6118.78	Eu I	140 h	6142.01	Be III	19	6159.82	Ce I
45	6098.34	Ce II	17	6118.90	Ce I	100	6142.487	Si I	10	6159.89	Pb II
95	6098.67	Hf I	35	6119.25	La III	40	6142.51	Nb I	150	6159.94	Lu II
40 h	6098.67	Ti I	600	6119.52	V I	150	6142.605	P IV	25	6160.20	Zr I
7	6098.803	Ar I	8	6120.27	K II	15	6142.92	Ce I	5000	6160.24	Pr III
500	6098.87	Ce III	300 l	6120.49	Np I	100	6143.063	Ne I	80	6161.15	In II
24	6099.083	Th I	30	6120.557	Th II	440	6143.20	Zr I	190	6161.18	Pr II
300	6099.142	Cd I	1000	6120.68	Tc I	90	6143.23	In II	1500 w	6161.22	Pr III
240	6099.35	Eu I	50	6120.83	Zr I	35	6143.36	Ce II	22	6161.29	Ca I
300	6099.39	Tc I	35 h	6121.01	Ti I	13	6143.94	W I	10	6161.354	Th I
11	6099.80	Ce I	170	6121.91	Zr I	20	6144.53	Os I	300	6161.74	Br II
150	6099.990	Cu II	2400	6122.14	Br I	65	6144.56	Ta I	19	6162.14	Ce I
900	6100.21	Pm I	22 c	6122.15	Pr I	100	6145.015	Si I	30	6162.17	Ca I
30	6100.87	Cu III	29	6122.22	Ca I	10	6145.441	Ar I	30bl	6162.23	TiO
400	6101.43	Xe II	45	6123.67	Ce I	35 c	6145.81	Re I	180 w	6162.45	In II
100	6101.58	Ta I	10	6124.480	Th I	30	6146.22	Ti I	3000	6162.56	Pa I
40	6101.87	Mo I	60	6124.67	Eu I	23	6146.43	Ce I	400	6163.16	Pm I
320bl	6101.87	ScO	85	6124.84	Zr I	100	6146.45	Xe II	120	6163.594	Ne I
13	6101.99	Ba III	90	6125.021	Si I	50	6146.82	Re I	22	6163.76	Ca I
30	6102.159	Fe I	35	6125.32	Er I	30	6147.73	Fe II	50	6164.32	Nb I
500	6102.49	Zn II	140	6125.50	F III	19	6147.84	Ce I	600 l	6164.75	Ac II
27	6102.72	Ca I	120	6126.22	Ti I	140 c	6148.10	In II	820bl	6165.08	YO
35	6102.72	Rh I	24	6127.15	Dy I	50	6148.13	Nb I	18	6165.38	Pr I
500 c	6102.96	Tc I	75bl	6127.38	YO	65	6148.23	Pr I	19	6165.45	Ce I
320	6103.54	Li I	680	6127.44	Zr I		6148.24	Pr II	350	6165.59	P II
320	6103.65	Li I	2000 c	6127.49	I II	1100bl	6148.36	YO	270	6165.94	Pr II
24	6104.29	Tb II	15	6128.0	Bi II	40000	6148.60	Br I	24	6166.44	Ca I
30	6104.580	Th I	8	6128.06	Rh I	180 b	6148.70	ScO	23	6166.67	Nd II
10	6105.635	Ar I	22	6128.25	W I	20	6149.24	Fe II	285	6167.76	N II
100	6106.27	O I	20	6128.34	V I	27	6149.28	Nd I	200 l	6167.83	Ac II
400	6106.40	Pm I	60	6128.450	Ne I	190 w	6149.5	In II	100	6168.43	Dy I
22	6106.72	Pr II	400	6128.62	Cs II	1000	6149.50	Hg II	26	6169.06	Ca I
28	6106.98	V I	230 w	6128.7	In II	400	6149.71	Sn I	28	6169.56	Ca I
160	6107.412	Cu II	240 w	6129.4	In II	21	6149.74	Ti I	9	6169.74	Fe III
29	6107.71	Nb I	50	6130.04	Sb II	800	6149.76	F I	60	6169.822	Th I
130bl	6107.82	YO	10	6130.63	Mo I	9	6149.99	Fe III	30	6170.06	Er II
10	6108.12	Ni I	1000	6130.80	Tc I	180	6150.15	V I	7	6170.174	Ar I
60	6108.15	Eu I	16	6131.53	Tm I	600	6150.384	Cu II	500	6170.27	As II
210 c	6108.66	In II	85	6131.574	Si I	23	6151.72	Ce I	85	6170.36	V I
28	6108.74	Ce II	90	6131.850	Si I	120	6151.72	YO	15	6170.46	Ta I
18	6109.08	Pr I	19	6132.00	Ce II	400 h	6151.76	Pm I	35	6170.49	Nd II
370bl	6109.93	ScO	1400bl	6132.06	YO	14	6151.993	Th I	150	6171.50	Sn I
425	6110.07	As II	320 w	6132.1	In II	30	6152.54	Ta I	40	6171.86	U I
50	6110.520	Pb I	19	6132.18	Ce I	60	6152.57	Yb II	500	6172.037	Cu II
45	6110.66	Sm II	150 c	6132.23	Tc I	20	6153.72	W I	150	6172.278	Ar II
20	6110.67	Ir I	23 d	6133.47	Nd II	150 b	6153.93	ScO	330	6173.05	Eu II
300	6110.78	Ba I	70cw	6133.60	Ho I	750	6154.222	Cu II	10	6173.096	Ar I
100	6111.49	Cd I	24	6133.64	Dy I	130	6154.50	Ta I	10	6173.22	Ca III
100	6111.53	Zn II	340	6134.55	Zr I	200	6154.60	Sn I	15	6175.16	Fe II
13	6111.66	W I	6	6134.82	Bi I	20	6154.87	W I	60	6175.25	Na II
280	6111.67	V I	120	6135.04	Y I	20	6154.94	Sb II	19	6175.28	Ce I
40	6112.837	Th I	500	6135.10	Ce III	27	6155.06	Nd I	14	6175.29	Tm I
430	6114.07	Gd I	200	6135.27	Rb II	160	6155.134	Si I	35	6175.39	U I
30	6114.22	Re I	280	6135.38	V I	30	6155.61	Zr I	10	6176.81	Ni I
65	6114.38	Pr II	11	6135.45	Ce I	400	6155.98	O I	2000	6177.39	Br I
160	6114.43	Cl I	400	6135.83	Ba II	35	6156.38	Ho I	150	6178.30	Xe I
300	6114.493	Cu II	40	6136.614	Fe I	27	6156.58	Ho I	45	6178.59	Nd I
130bl	6114.73	YO	40	6137.694	Fe I	450	6156.77	O I	110	6178.76	Eu I
100	6114.90	Pm II	19	6138.38	Ti I	75	6157.71	Zr I	120	6179.66	Xe I
100	6114.923	Ar II	150	6138.43	Y I	22	6157.82	Pr II	10	6179.98	Tl II
100	6115.08	Xe II	23	6139.03	Ce I	35	6157.83	Nd II	55	6180.42	Gd II
13	6115.52	W I	150 c	6140.0	In II	11	6158.03	Os I	14	6181.41	Tm II
180 w	6115.9	In II	25	6140.07	Ta I	490	6158.18	O I	110	6181.57	Al II
370bl	6115.97	ScO	200	6140.245	Cl I	24	6158.28	Dy I	150	6181.68	Al II
35	6116.01	Er I	100	6140.46	Zr I	40	6158.84	Ta I	250	6182.146	Ne I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
560bl	6182.23	YO	35	6200.81	Pr II	130	6224.50	V I	125	6243.813	Si I
290	6182.28	Al II	110bl	6200.86	GdO	12	6224.528	Th I	35	6244.08	Nd I
55	6182.34	Pr II	6	6201.37	Fe III	26	6225.20	Ru I	600 c	6244.18	Tc I
300	6182.42	Xe I	450	6201.52	Al II	290	6226.18	Al II	45	6244.35	Pr II
220	6182.45	Al II	360	6201.70	Al II	27	6226 50	Nd I	125	6244.468	Si I
50	6182.622	Th I	5 s	6203.04	Fe III	170bl	6226.51	ZrO	800	6244.48	I I
110bl	6182.68	GdO	18	6203.24	Re I	35	6227.70	Os I	120	6245.63	Sc II
27	6183.21	Er II	12	6203.493	Th I	35	6228.14	Lu II	20	6246.317	Fe I
450 h	6183.42	Al II	20	6203.51	W I	280 w	6228.3	In II	6	6246.59	K II
27	6183.91	Nd II	470	6204.261	Cu II	35	6228.94	Ce I	17	6246.65	Ti IV
100	6184.52	Pm II	1000	6204.86	I II	10	6229.11	Be I	5	6246.7	Sb III
100	6184.70	Tc I	13	6205.63	Pr II	19	6229.13	Ce I	45	6246.76	Sm II
95	6185.13	Hf I	60	6205.97	Xe III	30cw	6229.42	Re I	30	6246.97	Yb II
9	6185.26	Fe III	75 c	6206.309	Rb I	500	6229.64	Pm I	80	6247.56	Fe II
35	6186.15	Ti I	15 h	6207.60	Eu I	15	6230.51	Eu I	11	6247.74	Ti IV
35	6186.17	Ce I	27	6208.24	Nd I	40	6230.726	Fe I	140	6247.90	F II
7	6186.56	Fe III	25	6208.37	Ta I	430	6230.74	V I	16 h	6248.80	Lu I
550	6186.884	Cu II	450	6208.457	Cu II	35	6230.90	Er I	60	6248.95	Hf II
8	6186.89	Rh I	70	6208.65	Ho I	140 w	6231.1	In II	40	6249.79	Ta I
13	6187.96	Pr I	200	6208.91	Pm II	200	6231.21	Mn III	720	6249.93	La I
15	6187.97	Ce I	35	6208.98	Ce I	55bl	6231.62	GdO	110	6249.96	Sc I
150 b	6188.09	ScO	13	6210.59	Pr I	6	6231.62	Ti IV	55	6250.47	Eu I
260cw	6188.13	Eu I	620	6210.68	Sc I	360	6231.78	Al II	45	6251.05	Y I
300	6188.59	Np I	55	6210.70	Hf I	100	6232.29	P II	40 c	6251.76	Nb I
400	6188.676	Cu II	400	6210.87	F I	23	6232.45	Ce II	280	6251.82	V I
23	6189.35	V I	110bl	6211.71	GdO	100	6233.20	V I	55 b	6252.12	GdO
35	6189.40	Zr I	10	6212.503	Ar I	130	6233.57	F III	30	6252.554	Fe I
15	6189.66	Ta I	22	6212.73	Pr I	90 h	6233.73	Eu I	15	6253.65	Ce I
10	6191.18	Ni I	85	6213.05	Zr I	18	6234.17	Ho I	16	6253.72	Rh I
40	6191.558	Fe I	29	6213.06	Nb I	30	6234.40	Hg I	180	6254.188	Si I
55	6191.68	Ho I	500	6213.10	I I	30	6234.402	Hg I	20	6254.28	W I
1200	6191.73	Y I	120	6213.100	Cs I	70	6234.68	Na II	35	6255.10	Pr II
800	6191.88	I I	100 s	6213.11	Mn III	24 h	6234.856	Th I	45 c	6255.75	Ho I
12	6191.906	Th I	30	6213.429	Fe I	100	6235.266	Pb I	80	6256.01	Sc III
800	6192.66	Tc I	130	6213.87	V I	80	6235.36	Lu II	13	6256.36	Ni I
10000	6192.80	Pu I	12	6213.98	Ca III	270bl	6236.72	YO	45	6256.54	Sm I
150 b	6192.90	ScO	100	6214.22	Yb III	20 h	6236.80	Pr I	45	6256.66	Sm II
60	6192.96	Zr I	500	6214.61	Zn II	160	6237.320	Si I	150	6256.68	Ta I
15	6193.11	Ta I	100	6214.69	Zr I	28	6237.45	Ce I	15	6256.75	Mg III
24	6193.858	Th II	95 h	6215.28	Ti I	400	6237.79	Pm I	80	6256.83	O I
500	6194.07	Xe II	300 s	6215.90	Np I	8	6237.90	Zn I	85	6256.90	V I
160	6194.757	Cl I	5	6215.938	Ar I	60	6238.2	Xe III	100	6257.26	Zr I
7	6194.79	Fe III	3000	6216.35	Pa	40	6238.287	Si I	10	6257.424	Th I
100	6195.05	Pr III	450	6216.37	V I	20	6238.37	Fe II	900 c	6257.49	I II
140	6195.07	Eu I	11	6216.82	Ce I	23	6238.50	Nd II	23	6257.49	Nd I
15	6195.23	Ce I	28	6216.82	Hf I	45	6238.58	Hf I	13	6257.99	Ce I
6	6195.43	Fe III	750	6216.939	Cu II	100	6238.64	Mn III	380	6258.10	Ti I
19	6195.53	Ce I	150	6217.281	Ne I	13	6238.71	Ce I	85	6258.57	V I
2000	6195.63	Pr III	15	6217.599	Cs I	8 d	6239.03	Tl II	380	6258.70	Ti I
20	6196.23	Dy II	20	6217.89	Mo I	8	6239.17	Zn I	27	6258.73	Nd II
35	6197.45	Pr II	450bl	6217.96	YO	90	6239.41	Sc I	250	6258.96	Sc I
10	6197.66	Mo I	25	6217.97	Re I	13000	6239.65	F I	60	6259.05	Xe III
200	6197.72	In III	18	6218.06	Pr I	320	6239.78	Sc I	270	6259.09	Dy I
300	6197.96	Lu III	28 h	6218.31	V I	55	6240.13	V I	5	6259.81	Fe III
19	6198.05	Ce I	30	6219.279	Fe I	8	6240.954	Th I	80	6260.01	Na II
300	6198.092	Cu II	700	6219.844	Cu II	20 h	6241.05	Pr I	35 d	6260.02	Re I
600	6198.13	Lu III	55	6220.00	La III	75bl	6241.66	GdO		6260.24	Re I
100	6198.26	Xe I	100	6220.02	Xe II	7	6241.70	Os I	30	6260.36	Dy I
180	6199.01	P I	25	6220.35	Hg III	11	6241.87	Ce I	21	6260.77	Nb I
1000 c	6199.08	Rb II	75 h	6220.49	Ti I	160	6242.34	Lu II	50 b	6261.05	ZrO
450	6199.19	V I	110bl	6220.93	GdO	170	6242.81	V I	21	6261.063	Th I
70	6199.26	Na II	360	6221.02	Er I	400	6242.83	Ac II	300	6261.10	Ti I
26	6199.42	Ru I	65 h	6221.41	Ti I	13	6242.91	Ce I	55	6261.22	V I
160	6199.66	Lu II	25	6221.7	Xe III	50	6242.95	Th III	21	6261.418	Th I
590bl	6199.82	YO	2100	6221.87	Lu II	710	6243.10	V I	100	6261.55	O I
14	6199.99	Rh I	75	6221.96	Nb I	25	6243.120	Ar II	500	6261.848	Cu II
300 l	6200.00	Np I	300	6222.59	Y I	35cw	6243.24	Re I	240	6262.25	Eu I
30	6200.30	Ra I	45	6223.39	Nd I	10000	6243.35	Cm I	60	6262.25	Sc I
6	6200.75	Rn I	100 c	6224.28	In II	450	6243.36	Al II	260 d	6262.30	La II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
40	6262.55	Pr II	400	6286.06	Pm I	450	6305.5	S II	21	6327.278	Th I
55	6262.56	Er I	280	6286.4	S II	750	6305.67	Sc I	70	6327.47	Sm II
55bl	6262.64	GdO	10	6286.41	Re I	550	6305.972	Cu II	200	6328.52	Yb III
100	6263.25	Pm II	11	6286.83	Os I	13	6306.64	Ce I	30	6330.013	Cd I
15	6264.27	Ce I	30	6286.86	Er I	22	6306.68	Ho I	35	6330.10	Cr I
10	6264.27	Mo I	450	6287.1	S II	35	6307.06	Sm II	800	6330.37	I I
18	6264.54	Pr II	15	6287.36	Ta I	7	6307.29	K II	13	6330.62	Ru I
16	6265.88	Mo I	3	6287.6	Sb III	60	6307.60	Sc III	40	6331.35	Gd I
85	6266.32	V I	300	6287.79	Ce III	15	6307.657	Ar I	35	6331.68	Tb II
150	6266.495	Ne I	40	6287.91	Ta I	200	6307.70	Re I	45	6331.954	Si I
55	6266.95	Eu I	12	6288.28	Ir I	14	6308.15	Yb II	12	6331.97	Fe II
35	6267.06	Zr I	350	6288.696	Cu II	500	6308.16	Ce III	50	6332.91	Ta I
50	6267.14	Ge II	18 c	6289.02	Pr I	500	6308.29	Pm I	400	6333.50	I I
100	6267.28	Sm II	40	6289.34	Ta I	130	6308.77	Er I	17	6333.75	Gd I
45	6267.93	Er I	85	6289.73	Gd II	50	6309.06	Ta I	10	6334.2	Ga II
150	6268.07	Ge II	15	6290.74	Mo I	30	6309.11	Gd II	100	6334.428	Ne I
100	6268.34	Ge II	8	6291.192	Th I	150	6309.58	Ta I	7	6334.44	Ir I
10 h	6268.50	Ag I	60	6291.34	Eu I	26	6309.90	Sc II	24	6334.91	Tb II
150	6268.70	Ta I	50	6291.82	Sm II	35	6310.01	Ce I	15	6335.40	Ce I
130	6268.82	V I	45	6292.02	W I	10	6310.22	Kr III	1500	6335.48	Br I
60	6268.87	Er I	15	6292.41	Ti IV	200	6310.36	Pr III	450	6335.74	Al II
300	6269.40	Rb II	24 c	6292.43	Tb I	55	6310.49	Nd I	75	6335.82	Eu I
22	6269.41	Os I	200	6292.83	V I	100	6310.78	Sn I	30	6336.10	Ti I
500	6270.82	Xe II	23	6292.84	Nd II	60	6310.80	Na II	9	6336.12	Ru I
18 c	6271.37	Re I	45bl	6292.84	ZrO	28 h	6311.50	V I	17	6336.34	Gd I
45	6272.05	Ce II	30	6292.87	Gd I	25 h	6311.85	Hf I	100	6336.377	Ge II
400	6272.69	Pm I	6	6293.38	Rh I	100	6312.18	Tc I	10 p	6336.90	Ra I
45 b	6273.00	GdO	1000	6293.98	I I	25 c	6312.22	Ta I	11	6337.21	Ce I
1000	6273.349	Cu II	6 p	6294.50	Fe III	55	6312.24	Ti I	2000	6337.85	I I
8 d	6273.5	Te I	11	6294.89	Ca III	400	6312.492	Cu II	30	6338.10	Hf I
100	6273.71	Mn III	18	6295.22	Ru I	450	6312.7	S II	24 b	6338.10	YO
50	6274.116	Th II	60 b	6295.46	YO	300	6313.02	Zr I	55	6339.09	V I
50	6274.117	Th II	35	6295.58	Ce I	500	6313.13	I I	1000	6339.44	I I
170	6274.65	V I	180	6296.09	La II	24 h	6313.78	Eu I	22	6340.36	Zr I
22 c	6274.66	Pr II	170	6296.49	V I	100	6314.20	Pm II	13	6340.70	Ce I
80	6274.74	Na II	7	6296.872	Ar I	7	6314.46	Si III	65	6341.17	Ta I
60	6274.78	Yb II	23	6297.07	Nd I	10	6314.66	Ni I	300 l	6341.38	Np I
	6274.81	Pr II	11 c	6298.01	Pr I	30	6314.71	Zr I	27	6341.51	Nd II
35	6274.94	Er I	120 c	6298.325	Rb I	24 b	6316.20	YO	150	6341.68	Ba I
11	6274.94	Os I	5	6299.224	Rb I	8	6317.185	Th I	300	6341.75	Ce III
120bl	6275.01	YO	45	6299.42	Er I	27	6317.19	Gd I	35	6342.860	Th I
55	6276.31	Sc I	14	6299.46	Tm II	300 s	6317.84	Np I	14	6343.32	Dy I
15	6276.47	Ce I	28	6299.51	Ce II	26	6318.03	Ti I	22 h	6343.88	Pr I
5	6276.66	Rh I	22 h	6299.54	Hf I	500	6318.06	Xe I	35	6343.95	Ce II
23	6277.29	Nd II	120	6299.66	Zr I	11 h	6318.13	Pr II	400	6343.96	Xe II
8	6277.46	Rh I	170	6299.77	Eu I	19	6318.33	Hf I	26	6344.83	Sc I
400	6277.54	Xe II	23	6300.21	Ce I	7	6318.37	Pt I	50bl	6345.10	ZrO
600	6278.17	Au I	18	6300.70	Sc II	15	6318.58	Eu I	75	6345.22	Zr I
50	6278.34	Ta I	250	6300.86	Xe II	10	6318.72	Mg I	70 h	6345.35	Lu I
40	6278.68	Pr II	900	6301.009	Cu II	9	6319.24	Mg I	250 h	6345.75	Sr I
18	6278.76	Re I	13	6301.75	Mo I	7	6319.49	Mg I	30	6346.02	Ta I
30	6279.172	Th II	11	6302.05	Pr I	29	6319.53	Rh I	27	6346.65	Gd II
16	6279.43	Be II	35	6302.35	Pr II	160	6320.39	La II	10	6346.74	Mg II
30	6279.73	Be II	12	6302.76	Sb II	16	6320.85	Sc II	9	6346.96	Mg II
45	6279.76	Sc II	20	6303.21	W I	50	6321.35	Zr I	1000	6347.10	Si II
28	6280.18	U II	10	6303.251	Th II	200	6321.90	Re I	28	6347.11	Pr II
110	6281.28	Pr II	230	6303.41	Eu II	30	6321.94	Ho	22	6347.16	Er II
65	6281.33	Ta I	10	6303.42	Re I	45 c	6322.36	Pr I	60	6348.21	La III
17 h	6282.33	V I	65	6303.75	Ti I	11	6323.54	Mo I	10000	6348.51	F I
17	6282.63	Co I	285	6303.8	Se III	700	6323.84	Pm I	50	6349.48	V I
75	6283.452	Ge II	16	6304.05	Pr I	14	6324.66	V I	8 h	6349.7	Te I
100	6284.41	Xe II	15	6304.34	Zr I	75	6325.08	Ta I	120cw	6350.04	Eu I
9	6284.49	Ru I	10000	6304.66	Pu I	100	6325.166	Cd I	60000	6350.73	Br I
200	6285.16	V I	60	6304.789	Ne I	200	6325.6	Se I	80 d	6350.75	Re I
70	6285.47	B II	270 w	6304.8	In II	110	6325.91	La I	18 c	6350.98	Pr I
27	6285.79	Nd I	75	6305.15	Gd II	55	6326.13	Er I	27 h	6351.72	Gd I
27	6285.88	W I	35	6305.23	Pr II	120	6326.466	Cu II	27	6352.66	Tm I
15 h	6285.95	Eu I	15	6305.32	Fe II	8	6326.58	Pt I	60	6352.83	Na II
100	6286.01	Xe I	70 c	6305.36	Ho I	70	6326.84	V I	400	6352.94	Br II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
30 c	6354.35	Ho I	28	6378.52	U II	400	6403.384	Cu II	23	6431.63	V I
40	6354.35	Sn I	75bl	6378.56	ZrO	35	6404.21	W I	45	6431.84	Pr II
50 c	6354.555	Cs I	16	6378.59	Pr I	1000 l	6405.11	Am I	500 h	6431.93	Pm I
400	6354.72	Cd II	60	6378.82	Sc I	8	6405.9	Te I	15	6431.969	Cs I
18 h	6354.85	Lu I	500	6378.91	Ba II	40	6406.11	Eu I	22	6432.53	Er I
100	6354.86	Tc I	60	6378.91	Na II	35	6407.00	Zr I	20	6432.73	Yb II
14	6355.58	V I	15	6379.07	Ta I	55bl	6408.41	ScO	14	6433.18	V I
60	6355.89	Eu I	3000	6379.25	Pa I	9000	6408.47	Sr I	50 c	6433.22	Nb I
50	6355.911	Th II	23	6379.36	V I	22	6408.55	Gd I	35	6434.33	Zr I
75	6356.16	Ta I	360	6379.62	N II	100	6408.83	Tc I	19	6434.39	Ce I
600	6356.35	Xe II	19 h	6380.19	Hf I	26	6409.11	Mo I	150	6434.833	Cl I
100	6356.73	Tc I	6	6380.45	Rn I	150	6409.204	P III	1000	6435.00	Y I
22 c	6357.20	Pr I	1000	6380.75	Sr I	19 h	6409.52	Hf I	11	6435.16	V I
40	6357.22	Mo I	150	6380.77	N IV	180	6410.04	Eu I	250	6435.32	P II
50	6357.30	V I	40	6380.95	Gd II	2500	6410.32	Br I	130	6436.31	P II
5	6357.81	Fe III	23	6382.07	Nd II	10 h	6410.69	Pr I	23	6436.40	Ce I
60	6358.05	Na II	17	6382.19	Gd II	210	6410.99	La I	13 h	6436.55	Dy I
3000 l	6358.61	Pa I	55	6382.73	Eu I	55	6411.23	Pr I	100	6436.57	Pm II
25	6358.82	V I	16 h	6382.94	Re I	140	6411.32	Eu I	26 b	6437.08	ScO
55 c	6359.03	Pr I	120	6382.992	Ne I	14	6411.47	Re I	24	6437.18	Y I
500	6359.16	I I	15	6383.75	Fe II	20	6411.647	Fe I	13	6437.36	Ta I
28	6359.29	U I	10	6383.76	Ba III	185	6411.65	N I	830	6437.64	Eu II
15 b	6359.48	YO	75	6383.86	Eu I	30	6411.899	Th I	185	6437.68	N I
20	6359.86	Ac I	7	6384.67	Mn I	10	6412.39	Mo I	15	6437.762	Th I
500	6359.98	Cd II	20	6384.717	Ar I	50 b	6412.39	ZrO	2000	6438.470	Cd I
65	6360.84	Ta I	280	6384.9	S II	90	6413.35	Sc I	3000 l	6438.97	Pa I
70	6361.15	Na II	65	6385.20	Nd II	22 h	6413.41	Ho I	35	6439.07	Ca I
35	6361.27	V I	60	6386.23	Hf I	1000	6413.44	Ga I	18	6439.93	Eu I
100	6361.65	Pr III	13	6386.47	W I	24	6413.615	Th I	14	6440.54	Tm I
290 w	6362.3	In II	900 h	6386.50	Sr I	8000	6413.65	F I	235	6440.94	N I
1000 h	6362.34	Zn I	40	6386.80	Dy I	40	6413.68	Pr II	17	6440.97	Mn I
22	6362.87	Cr I	28	6386.84	Ce I	360	6413.7	S II	22	6441.14	Lu I
140	6363.05	F III	10	6387.55	Ca III	12	6414.72	Rh I	7 h	6442.78	Pr II
17	6363.23	Gd I	45	6388.19	Er I	10	6415.43	Pr I	200	6442.965	Cu II
9 h	6363.41	Ru I	600 h	6388.24	Sr I	70	6416.307	Ar I	9 h	6443.91	Pr II
11 h	6363.62	Pr II	16	6389.11	Mo I	20	6416.90	Fe II	360	6444.2	Se II
250 h	6363.94	Sr I	90	6389.45	Ta I	8	6417.57	Ru I	40	6444.61	Ta I
9	6365.79	Lu I	11	6389.57	Pr I	35 h	6417.91	Yb I	300	6444.74	Pr III
10	6365.88	Yb III	80	6389.87	Tc I	35	6418.98	Hg III	26 h	6444.84	Ru I
16	6366.00	Lu I	16	6390.23	Ru I	11	6419.10	Ti I	11	6444.89	Lu II
100	6366.34	O I	500	6390.31	Pm I	5	6419.4	Ga II	40	6445.12	W I
35	6366.35	Ti I	170	6390.48	La II	100	6419.54	Cs II	60	6445.74	Zr I
70	6366.41	Na II	11	6391.12	Mo I	300	6420.18	Kr II	30	6445.87	Ta I
50	6367.13	Te II	18 c	6391.99	Pr I	210	6420.64	N I	19	6446.12	Ce I
200	6367.27	P II	23 h	6392.21	Ta I	100	6421.026	Kr I	20	6446.20	Ra I
14	6369.140	Th I	28	6392.77	U I	20	6421.349	Fe I	55bl	6446.24	ScO
60	6369.25	Eu I	23	6393.02	Ce II	50	6421.92	Dy I	20	6446.34	Mo I
50	6369.27	Cu III	40	6393.18	Pr I	22	6422.42	Gd II	20	6446.43	Fe II
7	6369.575	Ar I	14	6393.28	V I	210	6423.02	N I	250	6446.68	Sr I
15	6369.87	YO	20	6393.602	Fe I	850	6423.884	Cu II	24	6446.87	Tb II
350 h	6369.96	Sr I	450	6394.23	La I	100	6424.37	Mo I	9	6448.13	Os I
11	6370.11	Ca III	11	6395.16	Ce I	12	6424.51	Ca III	750	6448.559	Cu II
35	6371.11	Ce II	90	6395.42	U I	17	6424.52	Gd I	110	6449.16	U I
1000	6371.36	Si II	2000	6396.56	Ga I	11	6425.29	Ce II	10000	6449.75	Pu I
55	6372.46	U I	24	6396.60	Dy II	12	6426.17	Zr I	30	6449.81	Ca I
30 c	6372.59	Ho I	280	6397.3	S II	45	6426.64	Sm II	15	6450.005	Th I
40	6373.06	Ta I	45	6397.96	Pr II	5	6427.96	K II	45	6450.24	Co I
400	6373.268	Cu II	100	6397.99	Xe II	55	6428.29	Eu I	200	6450.36	Ta I
14 h	6373.86	Ho I	280	6398.0	S II	210	6428.32	N I	90	6450.85	Ba I
100	6374.32	O I	160	6398.66	Cl I	65	6428.60	Ta I	20	6451.62	Zr I
200	6375.28	Xe II	9	6398.86	Os I	300	6429.26	Pr III	70	6452.34	V I
9	6376.45	Ru I	30	6399.999	Fe I	45	6429.63	Pr II	16 c	6453.44	Pr I
10000	6376.71	Cm I	35 h	6400.35	Yb I	100	6429.64	Pm II	70	6453.50	Sn II
40	6376.931	Th I	120cw	6400.93	Eu I	35	6430.07	Ce I	320	6453.60	O I
10	6377.11	Ba III	35	6401.07	Mo I	85 c	6430.46	Nb I	90	6454.11	N III
16	6377.61	Pr I	22	6401.44	Tm I	35	6430.47	V I	360	6454.44	O I
750	6377.840	Cu II	75	6402.01	Y I	250	6430.79	Ta I	9	6454.84	Pr II
10	6378.32	Tl II	200	6402.246	Ne I	30	6430.844	Fe I	21	6455.00	Co I
150	6378.33	Yb III	22	6403.15	Os I	8	6430.94	Tm II	22	6455.60	Ca I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
20	6455.83	Ta I	360	6482.70	N I	18 h	6502.43	Ta I	110	6531.43	V I
1000	6455.90	Tc I	150	6482.91	Ba I	50	6503.26	Zr I	15	6532.39	W I
400	6455.98	O I	18	6483.02	Eu I	11	6503.27	Ce II	60	6532.882	Ne I
250	6455.99	La I	25	6483.082	Ar II	600	6503.46	P II	7	6533.14	Os I
9	6456.18	Pr I		6483.17	Sr II	5500	6504.00	Sr I	100	6533.16	Xe I
200	6456.288	Kr I	1800	6483.56	Br I	9	6504.09	Pr I	8	6534.52	Pr I
3	6456.3	Ga II	20	6483.59	Dy II	55	6504.17	V I	285	6535.0	Se II
200	6456.38	Fe II	300	6483.75	N I	200 h	6504.18	Xe I	10000	6535.27	Pu I
7 h	6456.7	Te I	100	6484.181	Ge II	65	6505.52	Ta I	22 b	6535.30	ScO
80	6456.87	Ca II	11	6484.35	Zr I	185	6506.31	N I	18 h	6535.84	YO
60	6457.283	Th I	400	6484.421	Cu II	50	6506.36	Zr I	200	6536.44	Cs II
20	6457.63	Zr I	150	6484.440	P III	150	6506.528	Ne I	13	6538.11	W I
26 b	6457.78	ScO	35	6484.52	Sm II	11	6507.16	Ce II	15	6538.112	Ar I
185	6457.90	N I	325	6484.80	N I	600	6507.97	P II	40 h	6538.15	Gd I
120	6457.96	Eu I	12	6485.35	Ca III	11	6508.05	W I	11	6538.30	Os I
35	6458.03	Ce I	380	6485.37	Ta I	19	6508.14	Ti I	90	6538.60	Y I
10000	6458.33	Rb II	35 b	6485.40	ScO	50bl	6508.15	ZrO	10	6538.78	Ca III
30	6459.92	Ta I	35	6485.69	Nd I		6509.20	Sr II	11 h	6538.99	Ho I
600	6459.99	P II	27	6485.87	Er I	10000	6510.16	Cm I	16	6540.47	Pr I
9 h	6460.19	Pr I	150	6486.381	P III	400	6510.34	Pm I	210 c	6541.20	In II
200	6460.26	Tm I	45	6486.55	Pr I	16	6510.41	Rh I	22	6541.57	Er I
8	6460.83	Dy I	28	6486.59	Dy I	50	6511.47	Re I	500	6542.20	Pm I
600 c	6461.93	Tc I	10000	6486.71	Pu I	300	6511.74	As II	10	6542.24	Ca III
34	6462.57	Ca I	9 h	6486.97	Pr II	20	6512.364	Th I	50	6542.76	Sm II
50	6462.614	Th I	20	6487.32	Ra I	20	6512.54	Cu III	30bl	6542.90	ZrO
1100	6463.12	Lu II	400	6487.61	Pm I	300	6512.83	Xe II	130	6543.16	La I
17 h	6463.15	Yb II	120	6487.76	Xe I	23	6513.59	Ce II	28	6543.51	V I
400	6464.94	Cd II	11	6488.05	V I	90	6514.21	Na II	130	6544.04	Na II
35	6464.98	U I	10000	6488.86	Pu I	100	6514.39	Ta I	500 l	6544.16	Am I
250 h	6465.79	Sr I	10000	6488.89	Pu	1000	6514.62	Br I	10000	6544.21	Pu I
170	6466.246	Cu II	340	6489.06	Yb I	14	6515.25	Re I	20000	6544.57	Br I
25	6466.33	Yb III	110	6489.64	Zr I	11	6515.30	Ho I	65	6544.61	Nb I
5	6466.717	Th I	285	6490.5	Se II	20	6516.05	Fe II	12	6544.91	Re I
19	6466.88	Ce II	14	6490.70	Tm I	100	6516.10	Ta I	130	6545.75	Na II
120	6467.02	N III	14	6490.738	Th I	8	6517.14	Pr I	11	6545.97	Mg II
28	6467.39	Ce I	17	6490.97	Ce I	500	6517.25	Pm I	20	6546.239	Fe I
18	6467.72	Pr II	160	6491.22	N I	19	6517.31	Ce I	55	6546.28	Ti I
300	6468.44	N I	200 c	6491.68	Tc I	220	6517.317	Cu II	1000	6546.79	Sr I
10	6468.58	Dy II	24	6491.71	Mn I	18 h	6518.33	YO	60	6547.89	Be II
300 w	6469.0	In II	40 h	6491.75	Pr I	35cw	6518.68	Tb I	9	6548.03	Sc IV
300	6469.70	Xe I	55	6492.35	Er I	16	6518.79	Pr II	1500	6548.09	Br I
950	6470.168	Cu II	22	6493.10	Zr I	200	6519.43	Pm II	8 h	6549.12	Eu I
110	6470.21	Zr I	10	6493.13	Mo I	60	6519.59	Eu I	22	6549.25	Gd I
100	6470.27	Tc I	9	6493.49	Pr I	19	6519.70	Rh I	16 h	6549.84	Tl I
19 h	6470.29	Gd I	32	6493.78	Ca I	14	6519.78	Tm I	1700	6550.26	Sr I
12	6470.70	Eu I	11	6494.89	Pr I	23	6519.84	Mo I	35	6550.54	Zr I
20	6471.20	Mo I	60	6494.981	Fe I	1000 d	6520.45	Pm I	70	6550.97	Ho I
29	6471.66	Ca I	200	6495.53	Cs II	6	6520.85	Os I	120	6551.286	Cu II
27 c	6471.77	Ho I	26 b	6495.90	ScO	80	6521.13	Hg II	19	6551.70	Ce I
45	6472.34	Sm II	8	6496.44	Ru I	5	6522.044	Th I	80	6552.43	Na II
15	6472.623	Cs I	12000	6496.90	Ba II	15	6522.72	Eu I	7 h	6553.30	Pr I
150	6472.84	Xe I	22 c	6497.11	Pr I	55 c	6523.18	Lu I	12 h	6553.84	YO
30	6473.54	Be I	17	6497.69	Ti I	9	6523.45	Pt I	6	6554.160	Th I
35	6473.72	Ce I	15	6497.7	Bi II	6 h	6524.36	Si III	65	6554.23	Ti I
60bl	6473.79	ZrO	17	6497.84	Nb I	80	6524.68	Na II	10000	6554.41	Cm I
20	6473.99	Mo I	35	6498.67	Sm II	55 b	6525.62	ScO	11 h	6554.83	Ti
11	6474.91	Dy I	100	6498.72	Xe I	8	6526.17	Ba III	45	6555.462	Si I
9 h	6475.26	Pr II	300	6498.76	Ba I	45	6526.609	Si I	1000	6555.62	Rb II
50	6475.29	Na II	18	6498.94	Pr II	200	6526.82	Tc I	45	6555.65	Ce I
3	6475.73	Bi I	210	6499.54	N I	110	6526.99	La II	75	6556.07	Ti I
3	6476.24	Bi I	28	6499.65	Ca I	45	6527.199	Si I	15 h	6556.50	Hf I
29	6477.67	Lu I	600	6500.04	Pr III	150	6527.31	Ba I	70	6557.39	Y I
35cw	6478.02	Pr II	130	6500.24	O V	200	6528.65	Xe II	6	6557.488	Ge I
13	6479.17	Ho I	22	6500.72	Pr I	11	6528.74	Ru I	10	6557.49	Rn I
10	6479.18	Zn I	18 h	6501.23	YO	7	6528.87	Os I	45 b	6557.84	ScO
15	6480.11	Gd II	40	6501.38	Hg III	400	6530.083	Cu II	20	6558.02	Dy I
750	6481.437	Cu II	300	6501.49	Pr III	130	6530.70	Na II	17	6558.02	V I
265	6481.71	N I	45	6501.55	Eu I	50 h	6531.342	Th I	60	6558.36	Be II
750	6482.05	N II	5	6501.992	Th I	150	6531.43	Cl I	100 h	6558.48	Pm II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
5	6558.876	Th I	10	6585.13	Ta I	6	6610.12	Hg III	40 h	6632.28	Sm II
50000 c	6559.80	Br I	40 h	6585.21	Sm II	750	6610.56	N II	15	6632.44	Co I
15	6560.08	Ho I	1000	6585.27	I I	15 h	6611.20	Mo I	13	6633.26	V I
8	6560.10	He II	30	6586.02	Cs I	35cw	6611.28	Lu II	50	6634.36	Gd II
4	6560.45	Ru I	100	6586.39	Pm II	12	6611.38	Ti III	2 h	6636.44	Be II
5000	6560.81	Rb II	200	6586.510	Cs I	20	6611.49	Sb I	19 h	6636.49	Y I
25 h	6561.60	Ta I	15 c	6587.16	Ta I		6611.58	Lu II	185	6636.94	N I
100	6562.68	Au I	28	6587.23	Hf I	17	6611.62	W I	10 c	6637.25	Re I
120	6562.72	H I	200	6587.61	C I		6611.80	Lu II	35	6637.96	Nd II
180	6562.852	H I	24	6588.540	Th I		6611.95	Lu II	25	6638.221	Ar II
13	6563.20	W I	110	6589.72	Sm II	110	6611.95	Ta I	20	6639.740	Ar II
15	6563.42	Co I	19cw	6591.00	Nb I		6612.04	Lu II	35	6640.08	Gd I
25cw	6564.26	Ta I	30	6591.60	Gd I	22	6612.06	Ce I	10000	6640.17	Cm I
30	6564.52	Be I	50	6591.99	Zr I	8 h	6613.4	Te I	800	6641.396	Cu II
22	6564.62	Pr II	100	6592.29	Pm II	95	6613.75	Y II	10	6642.76	Gd I
55	6564.78	Gd I	40cw	6592.52	Re I	35	6614.15	Nb I	15	6643.37	Dy I
3	6565.070	Th I	20	6592.913	Fe I	8	6614.56	Os I	800	6643.54	Sr I
19 h	6565.62	Ti I	10	6593.34	Ra II	4	6615.43	Os I	20	6643.55	Yb I
11	6565.88	V I	15	6593.42	Gd I	100	6616.46	Pr III	16	6643.64	Ni I
300 l	6566.11	Np I	9 h	6593.74	Pr II	55	6616.67	Pr I	50	6643.698	Ar II
1000	6566.49	I I	4	6593.74	Ru I	3000	6617.26	Sr I	13	6643.79	V I
45	6566.77	Pr II	45	6593.79	Eu I	18bl	6617.94	ScO	30	6643.98	Gd I
35 b	6566.88	ScO	24	6593.940	Th I	9	6618.20	Ru I	20	6644.13	Cu III
25	6567.65	Cd II	14	6594.14	Dy II	11	6618.34	Pr II	45	6644.60	Hf II
75	6567.87	Eu I	2	6595.00	K II	230	6619.13	Mo I	21	6644.650	Th II
10	6568.00	Gd II	1000	6595.01	Xe II	11	6619.15	Lu II	235	6644.96	N I
140	6569.31	Sm II	3000	6595.33	Ba I	5000	6619.66	I I	18bl	6645.08	ScO
30	6569.43	Zr I	11	6595.48	Pr I	24	6619.946	Th II	1400	6645.11	Eu II
450	6569.69	F I	100	6595.56	Xe I	24	6619.947	Th II	185	6646.50	N I
150	6570.07	Kr II	10	6596.71	Zr I	5	6620.44	Mg II	10	6646.85	Gd I
35 h	6570.67	Sm II	50	6597.20	V III	1500	6620.47	Br I	19	6647.06	Hf II
7	6571.03	Pr I	400	6597.25	Xe II	15	6620.56	Zr I	14	6647.12	Pr I
1000	6571.31	Br I	900	6598.15	Pm I	6	6620.57	Mg II	30	6647.44	Sb II
12 h	6572.58	Y	800	6598.66	Pm I	20	6621.08	Ag I	14	6647.47	Ti III
23	6572.78	Ca I	100	6598.84	Xe II	75	6621.30	Ta I	10	6648.58	Te II
10	6573.80	Gd I	10	6598.84	Zr I	18	6621.58	Ti III	700	6649.81	Pm I
20	6573.93	W I	150	6598.953	Ne I	11	6621.74	W I	50	6650.38	Mo I
24 c	6574.04	Tb II	35	6599.11	Ti I	14	6622.49	Y I	400	6650.41	F I
15	6574.73	Nb I	50	6599.39	Th III	185	6622.54	N I	45	6650.57	Nd II
100	6574.84	Ta I	40 h	6600.2	Bi II	10000	6622.83	Cf I	40	6650.61	Y I
14 h	6575.18	Ti I	35 d	6600.58	Ho I	10	6623.00	Ce I	13	6650.89	Ce I
8	6575.54	Tm I	70	6601.11	Er I	12	6623.4	Bi III	5	6650.99	Pb V
18 b	6575.85	ScO	40	6601.83	Sm II	10	6623.54	V I	18bl	6651.46	TiO
20	6576.56	Zr I	50	6603.27	Zr I	30 c	6623.91	Re I	70	6652.093	Ne I
11	6576.83	Os I	18 h	6603.55	Eu I	750	6624.292	Cu II	27cw	6652.39	Re I
35	6576.85	Y I	95	6604.56	Sm II	10	6624.57	Mo I	22	6652.72	Ce II
200	6577.080	Cu II	60	6604.60	Sc II	5	6624.73	Ir I	30	6652.89	Au I
35 c	6577.11	Re I	15	6604.853	Ar I	50	6624.85	V I	9 h	6652.98	Ho I
10	6577.2	Bi II	80	6604.91	O I	800 w	6625.23	Pm I	235	6653.46	N I
5	6577.215	Th I	260	6604.94	Ho I	100 h	6625.54	Pm II	10	6653.55	Gd I
6	6578.00	Pr I	95	6604.96	Tm I	500 c	6625.57	Tc I	100	6653.83	O I
800	6578.05	C II	100cw	6605.19	Re I	19	6626.98	Nb I	150	6654.10	Ba I
30 b	6578.06	ZrO	24	6605.416	Th II	15	6627.23	Rn I	22bl	6654.42	ScO
140	6578.51	La I	50	6605.97	V I	8	6627.25	Tm I	30	6655.67	Nd I
200	6578.90	Pr III	19	6606.16	Nb I	9	6627.80	Rh I	210	6656.51	N I
23	6579.10	Ce I	15	6606.35	Ce I	13	6628.35	Ho I	75	6656.83	Pr II
1800	6579.14	Br I	700	6606.37	Pm I	35	6628.660	Cs I	35	6657.72	Tm I
150	6579.24	Tc I	10	6606.43	Rn I	7	6628.80	V V	22	6658.36	Dy I
160	6579.37	Dy I	15	6606.86	Ce II	30	6628.93	Ce I	11	6658.64	Tm I
300	6580.39	F I	11	6607.13	W I	120	6628.99	Ho I	6	6658.678	Th II
35	6581.82	Tb I	30	6607.17	Tb II	10	6629.37	Ti III	400	6659.05	Pm II
20000	6582.17	Br I	19	6607.28	Nb I	45	6630.14	Nd I	11	6659.40	Hf I
570	6582.88	C II	55	6607.47	Ho I	19	6630.16	Rh I	13	6659.68	Mo I
60	6583.48	Er I	15	6607.83	V I	2	6630.83	Mg I	8	6660.2	Te I
2000	6583.75	I I	10000	6608.95	Pu I	7 h	6631.00	Pr I	50 c	6660.20	Pb II
24	6583.907	Th I	11	6609.05	W I	10000	6631.26	Cf I	50 h	6660.52	Si II
10	6584.26	Hg III	15	6609.86	Pr I	50000 c	6631.62	Br I	5	6660.676	Ar I
6	6584.56	Pr II	26bl	6609.99	ScO	13 h	6632.06	Pr I	210cw	6660.84	Nb I
23	6584.87	Y I	10	6610.04	Gd II	15	6632.24	Ho I	450	6660.962	Cu II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
26bl	6661.01	ScO	30	6684.00	Ta I	400	6708.28	F I	13	6736.79	Pr I
19	6661.08	Cr I	35	6684.293	Ar II	30	6709.29	Hg III	25	6737.79	Nd II
500	6661.11	I I	26	6685.21	Eu I	25	6709.39	Ta I	65	6737.87	Sc I
100	6661.25	Pm II	500	6685.55	Pm I	180	6709.50	La I	18	6739.22	Tm I
10	6661.41	Ce I	500	6685.68	Pm I	17	6709.61	Zr I	35	6739.40	Sc I
29	6661.64	Dy I	1300	6686.02	Cl II	10	6710.42	Pt I	75	6739.88	Nb I
1400	6661.67	Cl II	10	6686.08	Ir I	12 h	6710.45	Eu I	40	6740.11	Nd II
500	6661.68	Pm I	15	6686.60	Ce I	9 c	6711.30	Re I	3	6740.37	Th IV
7	6661.81	Os I	10000	6686.87	Cm I	2	6711.87	Th IV	75 c	6740.73	Ta I
15cw	6662.24	Ta I	100	6687.10	Tc I	35	6713.20	Y I	55	6741.47	Sm II
30	6662.269	Th I	5 h	6687.51	Pr II	150	6713.28	P II	30	6741.64	Si I
15	6662.52	Ho I	150	6687.58	Y I	1200	6713.41	Cl II	25	6742.54	Nd I
21	6663.14	Ru I	15	6688.01	Sb II	30	6713.48	Hf I	5	6742.884	Th I
10000	6663.25	Cm I	22	6688.18	Zr I	6 h	6713.80	Tl I	80	6743.12	Ti I
400	6663.76	Pm I	8 h	6690.0	Te I	150	6713.939	P IV	160	6743.6	S I
5	6664.051	Ar I	55	6690.00	Ru I	10	6714.44	Ta I	600	6743.71	Pm I
21	6664.40	Y I	150	6690.09	Pm II	700	6714.67	Pm I	150	6744.38	C III
15	6665.00	Si II	18	6690.47	Mo I	120	6715.906	P IV	15	6744.70	Ce II
13	6665.59	Ce I	1800	6690.48	F I	160	6716.429	Hg I	30	6744.88	Eu I
600	6665.96	I II	22 b	6691.21	TiO	160	6716.43	Hg I	40	6745.05	Ho I
50	6666.35	Eu III	20 l	6691.27	Ac I	26	6716.68	Ti I	22	6745.52	Ti I
25	6666.359	Ar II	14 h	6691.83	Y I	50 h	6717.04	Si II	21	6746.08	Mo I
18 h	6666.55	Ti I	10000	6692.13	Br I	20	6717.043	Ne I	50	6746.27	Mo I
800 c	6667.51	Pm I	8	6692.724	Th II	500	6717.26	Pm I	5	6746.56	W I
5	6667.56	Si IV	10	6692.86	Gd I	120	6717.42	P I	10	6746.90	Ce I
22 h	6667.74	Ti	11	6692.93	Tm I	30	6717.69	Ca I	35 c	6747.09	Pr I
180	6667.82	Yb I	15	6693.08	W I	27	6717.88	Zr I	29	6747.93	Dy I
75	6667.86	Dy I	70	6693.55	Sm II	14	6718.14	Gd II	285	6748.8	S I
18	6667.99	Ti III	15	6693.61	Ta I	15	6718.30	Ru I	19 c	6749.19	Pr I
9	6668.39	Ti	8	6693.66	V I	300	6718.83	I II	900	6749.91	Pm I
150	6668.92	Xe I	1800	6693.84	Ba I	10	6719.32	Ra II	20 h	6750.28	Si II
11	6669.26	Cr I	95	6693.96	Eu I	300 l	6720.68	Np I	900	6750.48	Pm I
6	6669.60	Rn I	55cw	6694.32	Ho I	500	6720.71	Pm I	30	6751.22	Re I
50	6671.51	Sm I	300	6694.32	Xe II	30	6721.36	Tm I	300 s	6751.32	Np I
100	6671.88	Si II	7	6694.75	Y I	100	6721.853	Si I	20	6751.81	Rn I
10000	6672.72	Pu I	360	6696.02	Al I	27	6721.91	Er I	190 c	6751.88	In II
55	6673.41	Pr II	500 c	6697.29	I I	15cw	6722.34	Ho I	40	6752.35	Rh I
300 c	6673.66	Tc I	5	6697.712	Th I	185	6722.62	N I	50	6752.67	Gd II
100	6673.73	Ta I	230	6698.67	Al I	40 d	6723.07	Sm I	40	6752.73	Zr I
75	6673.78	Pr II	60	6699.228	Kr I	200 c	6723.284	Cs I	150	6752.834	Ar I
15	6674.19	Ti III	4 h	6699.25	Pr I	15 h	6723.61	Ta I	65 c	6753.00	V I
6	6674.697	Th I	16 h	6699.26	Y I	130 c	6723.62	Nb I	4	6753.20	Pb V
1500	6675.27	Ba I	20	6699.38	Si II	16bl	6723.95	TiO	14	6753.91	Gd II
180	6675.53	Ta I	600	6700.33	Pm I	12	6724.80	Ti III	35	6753.97	Mo I
10	6675.54	Ce II	18 b	6700.48	ScO	500	6725.78	Cd II	17	6754.61	Hf II
23 c	6677.14	Lu I	10	6700.64	Dy II	9	6726.34	Tm I	40	6754.91	Ta I
18	6677.18	Ti I	26	6700.66	Ce I	10000	6726.68	Cm I	13 c	6755.85	Ta I
100	6677.282	Ar I	70	6700.71	Y I	16	6727.459	Th I	5	6756.163	Ar I
150cw	6677.33	Nb I	7 h	6701.06	Eu I	700	6727.50	Pm I	200	6756.45	Pm II
700 h	6677.47	Pm I	65	6701.20	Nb I	25	6727.61	Yb II	20	6756.453	Th I
10000	6677.90	Cf I	7	6701.21	Si IV	100	6727.63	Pr III	7	6756.54	Ru I
90	6677.94	Tb II	11	6702.12	Zr I	17	6727.83	Gd II	1	6756.72	Be II
40	6677.989	Fe I	40cw	6702.61	Tb I	9	6727.94	Tm II	2	6757.13	Be II
11	6678.01	Zr II	10	6704.18	Gd II	200	6728.01	Xe I	450	6757.2	S I
100	6678.15	He I	35	6704.27	Ce I	8000	6728.28	Br I	10	6757.62	Dy I
15	6678.17	Yb I	8	6704.28	Rn I	15	6728.71	Ce I	100	6759.19	Cd II
90	6678.276	Ne I	13	6704.52	Ce II	27	6729.56	Os I	70	6759.87	Er I
13	6678.42	W I	18 b	6705.93	ScO	15	6729.57	Ce I	20	6760.02	Pt I
150	6678.43	Cl I	10	6706.04	Ce II	15	6730.45	Ru I	2000	6760.06	Br I
70	6679.21	Sm II	100	6706.27	Pm II	85	6730.73	Gd I	10	6760.12	V I
10	6679.56	Gd II	15	6706.46	Ta I	120 d	6731.84	Sm II	5 c	6761.19	Re I
19 c	6680.46	Ho I	600	6706.70	Pr III	400	6732.03	I I	8	6761.45	Sn II
200	6680.89	Pm II	20 c	6706.79	Tb II	110	6733.98	Mo I	75	6762.38	Zr I
35	6681.23	Gd II	10000	6706.85	Cm I	70 d	6734.06	Sm II	22	6762.92	Er I
24 c	6681.62	Ho I	11	6707.52	Ru I	16	6734.10	Ti III	13	6763.50	Mo I
15 h	6682.02	Ho	3600	6707.76	Li I	40 d	6734.81	Sm II	5	6764.45	W I
20000	6682.28	Br I	14	6707.76	Ti III	3	6735.126	Th I	6	6765.677	Th I
15 h	6683.28	Re I	3600	6707.91	Li I	9 h	6735.76	Lu I	45	6765.89	Dy I
3	6683.367	Th I	8	6708.07	V I	40	6735.99	Y I	180 c	6765.9	In II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
50 c	6766.49	V I	35	6790.85	Zr I	8	6819.27	Mg II	9	6844.39	Pr I
15	6766.612	Ar I	35	6790.92	Er I	20	6819.36	Ta I	18	6844.64	Ti
13	6766.74	Ho I	1800	6791.05	Sr I	50	6819.52	Sc I	55	6844.71	Sm II
21	6766.95	Ru I	6	6791.236	Th I	13 h	6820.27	Tm I	17 h	6844.83	Eu I
9 h	6767.48	Tm I	1600 c	6791.48	Br I	9	6820.27	W I	45	6845.24	Y I
22	6767.77	Ni I	18	6791.53	Os I	15cw	6820.38	Ho I	13	6845.33	Zr I
25	6768.70	Yb I	3000 h	6792.75	Pa I	17	6820.90	Gd I	9 h	6845.47	Pr II
85	6769.16	Zr I	10000	6793.15	Cm I	24	6821.64	Ho I	80	6845.76	Tm I
1000	6769.62	Ba II	50	6793.20	Cu III	320	6823.202	Cu II	17	6846.34	Zr I
11	6769.95	Hf I	13	6793.7	Ho I	5	6823.509	Th I	9	6846.59	Pr II
100	6770.362	Cu II	190	6793.71	Y I	15	6823.88	Ru I	35	6846.60	Gd II
13	6770.37	Ta I	30 c	6793.77	Lu I	21	6824.17	Ru I	25	6846.72	Nd II
75	6771.74	Ta I	95	6794.20	Sm II	100	6824.652	Cs I	100	6846.97	Zr I
300	6772.29	Pm II	130	6794.58	Tb II	18 c	6824.96	Ta I	14 h	6847.04	Eu I
9	6772.32	Ni I	300 s	6795.21	Np I	22	6825.44	Er I	13	6847.25	Ce I
27	6772.89	Zr I	25	6795.31	Nb I	13	6825.63	Mo I	8 h	6847.44	In I
27	6773.37	Er I	70 h	6795.41	Y II	17 c	6825.72	Ho I	70	6848.10	Er I
7000	6773.98	F I	1500	6795.53	F I	22	6825.98	Er I	400	6848.37	Pm I
40cw	6774.25	Ta I	9	6796.65	Rh I	15	6826.56	Hf I	30	6848.568	Si I
120	6774.26	La II	100	6796.87	Pm II	11	6826.59	Lu II	c	6848.91	Cs I
30	6774.28	Ce II	55cw	6798.60	Pr I	8 h	6826.62	Ho	16	6848.92	Mo I
23	6774.54	Pd I	70	6798.63	Tc I	90	6826.92	U I	27	6849.26	Zr I
28 c	6774.68	Ho I	3	6798.747	Th I	14	6826.95	Tm I	25 c	6849.35	Nb I
30	6775.02	Ru I	13	6799.27	Ta I	200	6827.32	Xe I	13	6850.07	Hf I
3000 l	6775.07	Rb II	690	6799.60	Yb I	13	6827.33	Rh I	17 c	6850.46	Pr II
35	6775.59	Ce I	10 h	6799.88	Mo I	35cw	6827.60	Pr II	15	6850.83	Ta I
9	6777.93	Tm I	10	6802.62	Mo I	200	6827.96	Pr III	7 h	6851.65	Si III
30	6778.116	Cd I	300 l	6802.62	Np I	85	6828.11	Nb I	13	6852.56	Zr I
10	6778.28	Ce I	140	6802.72	Eu I	100	6828.25	Gd I	11	6852.77	Pr I
15	6778.313	Th I	12 h	6803.15	Y I	8	6828.43	W I	80	6852.96	Dy I
40 h	6778.61	Sm II	30	6804.00	Nd II	45	6828.78	Zr I	8 h	6852.97	Ho
400	6778.78	Pm I	7	6805.31	W I	18 d	6828.87	Mo I	4	6853.74	W I
2000	6779.48	Br I	1000	6805.74	Xe II	11	6829.036	Th I	18	6854.12	Tm I
110	6779.77	Tm I	300 l	6805.81	Np I		6829.05	Mo I	100	6854.63	Pr III
15	6780.413	Th I	300	6806.216	Cu II	14	6829.12	Tm II	20 h	6854.7	Te I
50	6780.51	Ge II	14	6806.61	Os I	29	6829.54	Sc I	15	6855.18	Fe I
7	6781.45	Mg II	6	6806.67	Sb II	10	6829.73	Ce II	50000	6856.03	F I
14 h	6782.00	Tm I	6	6806.79	Rn I	50	6829.82	Si II	75	6856.03	Sm II
30 h	6782.54	Eu I	18	6807.81	Ce I	260	6829.90	Re I	22	6856.46	Dy I
100	6783.09	Pm II	50 h	6808.6	Bi II	9 c	6829.94	V I	12	6856.55	Ce I
14	6783.39	Gd I	10	6808.82	Ce I	5	6830.01	Ir I	60	6856.90	Tc I
100 c	6783.72	In II	3	6809.511	Th I	19	6830.50	Pr II	30	6857.13	Gd II
250	6783.90	C II	400	6809.647	Cu II	23	6831.09	Tm I	200	6857.30	Pr III
65	6784.52	Pd I	40 c	6810.46	Ta I	150	6831.3	Se I	11	6857.68	Rh I
10000	6784.66	Pu I	13cw	6811.04	Ho I	7	6831.52	Ru I	14	6858.24	Y II
40	6784.98	V I	200	6811.68	Pm II	6 h	6831.56	Si III	50	6858.58	Pm II
7 c	6784.99	Pr II	11	6811.76	Pr II	13	6832.00	Ta I	35	6858.70	Hf I
30	6785.12	Tb II	10	6812.03	Mo I	15	6832.44	V I	18	6860.39	Ti
55 c	6785.43	Ho I	26	6812.40	V I	14	6832.49	Y II	120	6860.93	Sm I
80	6786.00	Tc I	4000	6812.57	I II	45	6832.89	Zr I	1800	6861.15	Br I
15	6786.32	V I	7	6812.86	Mg II	800	6833.30	Pm I	20	6861.269	Ar II
26	6786.33	Gd II	17cw	6812.87	Pr II	4 h	6833.42	Pd I	35	6861.47	Ti I
30	6786.56	Be I	160 c	6813.25	Ta I	9000	6834.26	F I	15	6862.26	Ti III
2200	6786.74	Br I	180 c	6813.41	Re I	11 h	6834.30	Eu I	40	6862.82	Sm II
15	6787.15	Zr II	8	6813.51	Ru I	14	6834.925	Th I	4	6862.873	Th I
10	6787.18	Gd I	13	6814.04	Pr II	50	6835.03	Sc I	15	6864.25	Gd I
13	6787.23	Ru I	12	6814.56	Gd I	180	6835.42	Dy I	360	6864.54	Eu I
14 h	6787.48	Eu I	9	6814.92	W I	8	6836.95	Rn I	55	6865.13	Er I
8	6787.85	Mg II	14	6814.94	Co I	8	6837.57	Rn I	15	6865.13	Ta I
18	6788.52	Tm I	21	6815.16	Y I	20 h	6837.6	Te I	300 l	6865.45	Np I
150	6788.71	Xe II	35	6816.06	Eu I	40	6838.88	Mo I	600	6865.69	Ba I
40cw	6788.99	Ta I	300 s	6816.44	Np I	12	6839.58	V I	17cw	6865.85	Ho I
85	6789.27	Hf I	26	6816.49	Gd I	150	6840.29	Cl I	210	6866.23	Ta I
10 h	6790.0	Te I	35	6817.08	Sc I	17	6840.93	Eu I	5	6866.367	Th I
60	6790.00	Sm II	9	6817.61	Pr I	12	6841.90	V I	1000	6866.80	Pr III
6500	6790.04	Br I	12	6818.20	Dy I	60	6842.60	Pt I	3	6867.48	He I
13 c	6790.06	Ta I	15	6818.23	Ce I	25	6844.05	Sn II	300 h	6867.85	Ba I
30	6790.37	Nd II	30	6818.45	Si II	250	6844.157	Cu II	320	6868.791	Cu II
100	6790.37	Xe II	160	6818.94	Hf I	120	6844.26	Tm I	8000	6870.22	F I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
11 c	6870.44	Pr I	4 h	6900.13	In I	18	6934.05	Yb II	10	6966.5	Tl II
100	6870.455	Cs I	40	6900.43	Nd II	13	6934.10	Mo I	8	6969.49	Ta I
10 c	6870.88	V I	40	6900.55	Ta I	9	6934.23	W I	8 h	6970.38	Pr
19	6870.92	Nb I	29	6900.59	Zr I	150 w	6934.55	Pr III	500	6970.96	Pr III
150	6871.289	Ar I	14	6900.73	Gd II	12	6936.28	K I	8 c	6971.31	Ta I
8	6871.56	V I	50	6901.16	Th IV	5	6936.652	Th I	85	6971.53	Re I
100	6872.11	Xe I	4	6901.58	Os I	10	6937.37	Tm I	9	6971.53	Ta I
270	6872.231	Cu II	40	6901.98	Tb I	220	6937.553	Cu II	15	6971.66	Gd II
14	6872.40	Co I	150	6902.10	Ta I	50	6937.664	Ar I	3000 s	6972.09	Np I
9	6873.92	Ti I	15000	6902.48	F I	8	6938.47	Zn I	17	6972.49	Nb I
1000	6874.0	Ba II	25 c	6902.89	Nb I	20	6938.77	K I	8	6972.91	Rh I
40	6874.18	Tb II	500	6903.52	Pr III	8 h	6939.33	Ta I	200	6973.297	Cs I
12	6874.35	Ti III	60 h	6903.67	Eu I	10	6939.45	Ce I	19	6973.50	Ce II
8	6874.754	Th I	15 h	6903.80	Ho I	40cw	6939.49	Ho I	12	6974.50	V I
180	6875.27	Ta I	20	6904.36	Zr I	24	6941.39	Nd II	10	6975.91	Zr I
4	6876.01	W I	100	6904.678	Kr I	800 h	6942.11	Xe II	100	6976.18	Xe I
40	6876.36	Nb I	22	6906.53	Dy II	14 h	6942.52	Mn I	12	6976.35	Gd II
35	6876.74	U II	300 s	6907.13	Np I	3	6943.20	Zn I	80	6976.523	Si I
40	6877.49	Ta I	29	6907.37	Zr I	35	6943.611	Th I	5 h	6976.69	Tm II
4800	6878.38	Sr I	250	6907.461	Hg I	14 h	6943.70	Ti I	19	6976.7	Ho II
5	6878.70	Os I	250	6907.52	Hg I	8	6943.96	Lu II	150	6977.572	Cu II
270	6879.404	Cu II	35	6908.07	Nb I	1000	6944.94	Ce III	10	6978.27	Gd II
5	6879.582	Ar I	13	6908.20	Mo I	15	6945.21	Fe I	30 h	6978.48	Cr I
20	6879.94	Rh I	9	6908.26	Y I	10000	6945.72	Pa I	15	6978.51	Ti IV
27	6879.98	Er I	5	6908.29	W I	17	6945.98	Gd II	16	6978.71	Mo I
10000	6880.16	Pu I	3	6908.988	Th I	17	6946.07	Nb I	16	6979.15	Rh I
5 h	6881.62	Cr I	6000	6909.82	F I	20 c	6946.87	Ta I	19	6979.59	Hf I
300	6882.16	Xe I	7000	6910.14	Pr III	10	6947.39	Mo I	11 h	6979.82	Cr I
10 h	6882.38	Cr I	14 h	6910.17	Eu I	29	6948.46	Zr I	100	6979.83	Pr III
21 h	6883.03	Cr I	80	6910.22	Xe II	5	6949.54	Tm I	24	6979.88	Y I
9	6883.36	Ho I	19	6911.08	K I	29	6950.28	Dy II	8 c	6980.12	Pr I
1 h	6884.22	Be I	24	6911.227	Th I	24 h	6950.31	Y I	20	6980.22	Ra I
6 h	6884.44	Be I	45	6911.40	Hf I	45cw	6950.39	Ho I	26 h	6980.86	Gd I
7	6884.66	Pr I	26	6911.48	Ru I	30	6950.51	Sm II	21	6980.91	Hf II
21	6886.28	Mo I	300 h	6912.91	Np I	65	6951.26	Ta I	3	6981.086	Th I
29	6887.22	Y I	12	6913.19	Ti I	11	6951.42	Dy I	300	6981.886	Cl I
21	6887.63	Gd II	15cw	6913.47	Ho I	7	6951.478	Ar I	26	6982.01	Ru I
10	6888.174	Ar I	12	6913.85	Ti IV	10	6951.68	Y II	13 h	6982.44	Dy I
120	6888.29	Zr I	35	6914.01	Mo I	150	6952.871	Cu II	100	6982.75	Be I
13	6888.50	Ho I	10	6914.56	Ni I	150	6953.84	Zr I	35	6983.491	Cs I
22	6888.83	Dy I	30 h	6914.82	Eu I	45	6953.88	Ta I	23	6983.52	Ta I
20	6889.303	Th II	6	6915.86	Tm I	5	6954.657	Th I	10	6983.82	Ce II
10	6891.16	Rn I	5	6916.129	Th I	120	6955.29	Sm II	13	6984.27	W I
10000	6891.38	Pu I	100	6916.57	Gd I	13hl	6955.3	Ho I	6	6984.95	Os I
320 w	6891.5	In II	9	6916.70	Ho I	400	6955.52	Cs II	10	6985.11	Ho
10	6892.11	Pb I	20	6916.87	Zr I	500 s	6955.58	Am I	20	6985.15	Yb III
16	6892.36	Mo I	45	6917.31	Lu I	11	6956.02	Os I	50	6985.89	Gd II
1200	6892.59	Sr I	40	6918.32	Nb I	15	6957.74	Gd II	30	6986.02	Ce I
8	6892.71	Pr I	21	6920.62	Gd II	10	6958.04	Y I	25	6986.09	Nb I
15 c	6892.96	Ho I	110	6923.23	Ru I	40	6958.08	Dy I	10	6988.75	Gd II
10	6893.66	Ce I	27 h	6924.13	Cr I	1000	6958.78	I II	26	6988.94	Mo I
7	6894.00	V I	30	6924.81	Ce I	15	6959.24	Gd II	55	6989.656	Th I
10000	6894.59	Cf I	15	6924.99	Gd II	3000	6960.09	Pa I	500	6989.78	I I
4	6894.90	Mg I	17 h	6925.20	Cr I	7	6960.250	Ar I	12	6989.96	Mn I
c	6895.01	Cs I	100	6925.53	Xe I	10	6960.64	Mo I	85	6990.32	Nb I
21	6896.00	Y II	10	6926.19	Hf I	3000 h	6961.78	Pa I	5bl	6990.68	ScO
10	6896.12	Ti III	21	6926.49	Gd I	5 b	6963.12	ScO	120	6990.690	Se I
55	6896.37	Tb II	10000	6927.10	Cf II	300 l	6963.63	Np I	150	6990.84	Zr I
15	6896.77	Ta I	140	6927.38	Ta I	8	6964.12	W I	2000	6990.88	Xe II
17	6897.95	Ho I	15	6928.32	Zn I	7	6964.18	K I	4 h	6991.12	Bi I
15	6897.97	Dy II	140	6928.54	Ta I	14	6964.33	Gd I	13	6991.30	Dy I
10	6898.01	Mo I	100	6929.467	Ne I	12	6964.67	K I	100	6991.792	Se I
21	6898.21	Eu I	15	6929.55	Dy I	6	6965.40	Mg I	75	6991.92	Gd I
10	6898.45	Ce II	5	6929.88	Ir I	10000	6965.431	Ar I	150	6992.690	P III
6	6898.56	Tm I	1000 s	6930.31	Np I	65	6965.67	Rh I	3000 s	6992.73	Pa I
10	6898.98	Mo I	16	6932.38	Zr I	15	6965.947	Th I	24	6993.038	Th II
1000	6899.06	Pr III	300	6932.903	Cl I	180	6966.13	Ta I	21	6993.18	Gd I
65	6899.32	Dy II	14 h	6933.15	Ti I	4000	6966.35	F I	8	6993.27	W I
45 h	6899.95	Tb I	14	6933.52	Y I	60	6966.44	Zr I	4	6994.06	W I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
80	6994.32	Zr I	17	7024.58	Nd II	7	7054.74	Nd II	300 s	7080.01	Np I
9	6994.38	Ho	50	7025.03	Ta I	13 b	7054.80	LaO	13	7081.22	Mo I
110 d	6995.22	Ta I	5bl	7025.72	ScO	16	7054.97	Sm II	15 h	7081.30	Ta I
	6995.49	Ta I	21	7026.07	V I	200	7055.42	Rn I	250	7081.90	Hg I
17 c	6996.11	Nb I	3	7026.462	Th I	35	7055.95	Dy II	150	7082.15	Xe II
23	6996.63	Ti I	100	7027.40	Zr I	10	7056.43	Tm II	90	7082.37	Sm II
60	6996.76	Gd II	26	7027.98	Ru I	25	7057.36	Zr I	17	7082.85	Tb II
45	6998.10	Dy I	3	7028.68	W I	14	7057.96	Zr I	8	7082.93	Nd II
3 h	6998.36	Si IV	6 h	7029.40	Tm I	10	7058.02	Gd II	60	7083.97	Al I
10	6998.90	Rn I	70	7030.20	B II	12	7058.55	Er I	100	7083.99	Pr III
12	6999.13	Mo I	150	7030.251	Ar I	11	7058.68	Ce II	30	7084.171	Th I
20	6999.88	Yb II	7	7030.33	Hf II	80	7059.107	Ne I	18	7084.57	Ti III
1	7000.0	Ga II	5000	7030.39	Pr III	10000	7059.23	Pu I	70	7084.64	Al I
20	7000.21	Ta I	23	7031.24	Lu I	6000	7059.94	Ba I	45	7084.99	Co I
14 h	7000.71	Ho	13	7031.51	Ta I	11	7060.00	Ce I	200 c	7085.21	I II
17	7000.75	Gd II	40	7031.90	B II	22	7060.21	Mo I	21bl	7085.40	LaO
18	7000.806	Th I	26	7032.05	La I	8	7060.41	Mg I	20	7085.40	Ta I
18	7000.806	Th I	100	7032.413	Ne I	6	7060.654	Th I	40 d	7085.52	Sm II
22	7001.40	Er I	12	7033.	Bi II	15	7060.67	Os I	9	7086.06	Ru I
16	7001.58	Rh I	10	7033.21	Nd	5	7060.97	Tm I	500 c	7086.18	Tc I
16	7001.60	Mo I	12	7034.34	Tm I	7	7061.47	Nd II	35	7086.35	Ce II
360	7001.92	O I	250	7034.903	Si I	35	7061.75	Ce II	600	7086.814	Cl I
450	7002.23	O I	7	7035.13	Hf I	11	7061.90	Hf I	140	7087.30	Zr I
150	7002.37	Tc I	19 h	7035.18	Y I	300	7062.065	Se I	12	7087.35	Ru I
180	7003.567	Si I	8 b	7035.77	ScO	15	7062.87	Hf I	45bl	7087.89	TiO
15	7004.66	Ti I	14 h	7035.86	Ti I	13	7063.34	Mo I	26	7088.30	Sm I
40	7005.07	Ta I	2	7036.15	Bi I	7	7063.69	V I	11	7089.22	Tb II
10000	7005.19	Br I	7	7036.281	Th I	160	7063.83	Hf I	24	7089.339	Th II
10	7005.46	Zr I	13	7036.73	Sm II	11	7064.49	Ce I	25	7089.43	Zr I
180	7005.883	Si I	10	7037.04	Yb III	12 h	7065.04	Er I	12 h	7089.71	Nd II
9	7005.99	Tb II	150 h	7037.25	C III	200	7065.19	He I	16	7091.16	Sm I
45	7006.16	Gd II	21	7037.26	Gd II	30	7065.71	He I	200	7091.86	Hg I
35cw	7006.63	Re I	35	7037.30	Nd II	160	7066.23	La II	11 h	7092.08	V I
75	7006.96	Ta I	45000	7037.47	F I	8	7066.41	Nb I	12 h	7092.09	Nd
14	7008.35	Ti I	22	7037.98	Mo I	40	7066.89	Nd II	300	7092.27	As II
13 h	7008.97	Y I	17	7038.04	Nb I	10000	7067.218	Ar I	10000	7092.46	Pu I
10	7009.93	Y I	11	7038.76	Rh I	20	7067.44	Fe II	12 h	7092.74	Nd II
5	7010.79	Tm I	40	7038.80	Ti I	10	7068.09	Gd II	12 h	7092.94	Nd
17 h	7010.80	Nd II	40	7039.07	Ta I	65	7068.37	La I	23	7093.02	Ta I
200	7010.809	Se I	10	7039.13	Te II	4 h	7068.41	Si IV	60	7093.12	Tc I
14	7010.94	Ti I	300 s	7039.14	Np I	100	7068.736	Ar I	17 h	7093.98	Nd I
13 b	7011.22	LaO	90	7039.22	Sm II	10000	7068.90	Pu I	5 b	7094.38	ScO
150	7013.875	Se I	120	7040.20	Eu I	23	7069.11	Ti I	11 h	7094.40	Hf I
300	7014.02	Np I	26 b	7040.84	LaO	14	7069.84	Mn I	35	7094.46	Zr I
6 h	7014.31	Tm II	10000 l	7040.85	Bk I	5500	7070.10	Sr I	11 c	7095.18	Pr I
3	7015.319	Th I	90	7042.24	Sm II	21bl	7070.79	LaO	20 h	7095.42	Nd I
12	7015.38	Ti III	13	7042.40	Pr I	11	7070.99	Er II	8	7095.49	Ba III
10	7016.06	Te II	10	7043.78	Yb II	18	7071.00	Gd I	30	7095.50	Sm I
11	7016.44	Pd I	8	7044.45	Pr II	10	7071.93	Ti III	50	7095.59	Zr I
100	7016.57	Tc I	30	7045.795	Th II	23	7072.05	Ti	16	7096.33	Sm I
10	7016.60	Gd I	110	7045.96	La I	5 b	7072.37	ScO	14 c	7096.34	Lu I
30	7017.28	Si I	190 c	7046.81	Nb I	20	7072.64	Ti III	540	7097.70	Zr I
20	7017.42	Dy I	6 h	7047.94	Si IV	18	7073.63	Gd I	14	7098.11	Gd I
90	7017.646	Si I	13	7049.15	Sm II	10000 l	7074.52	Cf I	3	7098.22	W I
8	7017.88	W I	50	7049.369	Ge II	12	7074.54	Eu I	12	7098.58	Ho
10	7017.90	Tm I	14	7050.65	Ti I	19	7074.67	Sm I	14	7098.73	Gd I
10	7018.569	Th I	14	7051.00	Gd II	23	7074.79	U I	40 c	7098.94	Nb I
8	7018.85	Nd II	7	7051.07	Pr I	9	7075.13	Y I	10	7100.512	Th II
300 l	7018.91	Np I	3 h	7051.24	Ga I	24	7075.14	Dy II	15	7100.54	Hf I
7	7019.25	Hf I	50	7051.292	Ne I	100	7075.21	Pr III	3000 h	7100.94	Pa I
90	7020.44	Sm II	90	7051.52	Sm II	8	7075.23	Nb I	26bl	7101.02	LaO
17	7020.92	Nd II	7	7052.14	Nd II	24	7075.333	Th II	18	7101.27	Er I
40	7021.51	Pr II	21	7052.89	Co I	3000	7076.27	Pa I	27	7101.61	U I
200	7022.860	Cu II	29	7052.94	Y I	13	7076.38	La I	18	7101.64	Rh I
21	7023.48	Nb I	15	7053.619	Th II	4500	7076.62	Pr III	17cw	7102.01	Nb I
75	7023.67	La I	13 h	7054.28	Y I	330	7077.10	Eu II	6	7102.58	V I
90	7024.050	Ne I	12	7054.51	Ce I	10	7079.07	Ho	300	7102.72	As II
65cw	7024.15	Re I	40bl	7054.51	TiO	6	7079.78	Tm II	280	7102.91	Zr I
10	7024.53	Pr I	13	7054.62	Gd II	10	7079.99	Pr I	170	7103.72	Zr I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
15	7104.45	Rh I	17	7130.06	Nb I	25	7164.443	Fe I	20	7193.60	Pb II
30	7104.54	Sm I	6	7130.12	Ge I	6	7164.66	Eu I	30	7193.90	Si I
11	7105.04	Ce II	15	7130.94	Fe I	70	7164.69	Si I	570	7194.81	Eu II
10	7106.14	Tm I	19bl	7131.58	LaO	1000	7164.79	I I	300	7194.896	Cu II
19	7106.23	Sm I	13	7131.80	Sm I	500	7164.83	Xe II	600	7195.24	Ba I
100	7106.48	Eu I	570	7131.81	Hf I	100	7165.45	P I	10 h	7195.89	Tb II
5 h	7106.82	Ga I	3	7132.613	Th I	200	7165.545	Si I	10 h	7195.93	Y I
25	7107.478	Ar I	12	7132.95	Zr I	100 w	7165.64	Pr III	14 h	7197.00	Er I
10000	7107.85	Bk I	27	7134.08	Mo I	8	7165.94	Lu II	5	7197.02	Ni I
8	7108.05	Ta I	13	7135.73	Gd II	26	7167.13	Ti	13	7197.08	Gd II
17	7109.26	Dy II	10	7136.01	Sm I	250 h	7167.24	Sr I	5	7198.62	W I
8	7109.67	Er I	7	7137.33	Pr II	7	7167.77	Pr II	7	7198.7	Ga II
3	7109.861	Th I	12 h	7138.14	Sc I	170	7168.37	Gd I	10	7199.00	Nd II
110	7109.87	Mo I	26	7138.91	Ti I	30	7168.896	Th I	7	7200.046	Th I
5	7110.90	Ni I	12	7139.39	Sm II	590	7169.09	Zr I	11	7200.16	W I
4 h	7111.18	W I	15	7140.52	W I	14	7169.13	Sc I	13	7201.41	Gd II
140	7111.68	Zr I	16	7140.74	Zr I	23	7171.53	Ti	11	7201.56	Ce II
500	7112.53	Pr III	50	7141.21	Ra I	3000 h	7171.55	Pa I	50	7201.62	Zr I
11	7112.69	Tb I	200	7141.28	Tc I	11	7171.79	Ti III	16	7201.89	Ce I
40	7112.82	Zr I	16	7141.42	Ce I	21	7172.26	Gd II	31	7202.19	Ca I
250	7113.18	C I	10000	7141.66	Pu I	10	7172.67	Sm I	15000	7202.36	F I
18	7113.52	Zr I	4	7141.72	Ru I	2 h	7172.9	Ga I	10	7203.55	Ce I
20	7113.73	Pt I	12 h	7142.04	Nd II	110	7172.90	Ta I	26 b	7203.64	TiO
20	7114.55	Pr I	2000	7142.06	I I	15	7173.373	Th I	65	7204.28	Tb I
10000 s	7114.89	Pa I	6	7142.55	Rh I	100	7173.938	Ne I	10	7206.33	Os I
11	7115.08	Ce II	9	7142.79	Lu I	300 l	7174.83	Np I	70	7206.980	Ar I
250	7115.19	C I	7	7143.10	Lu I	13 c	7174.91	Ta I	30	7207.381	Fe I
250	7115.63	C II	10	7143.72	Nd	13	7175.11	Dy II	35	7208.006	Th I
26	7115.96	Sm I	40 d	7143.98	Sm II	150	7175.12	P I	10 c	7208.85	Pr II
1 h	7116.3	Ga I	12	7144.47	Zr I	30	7175.55	Eu I	19 c	7208.94	Nb I
10 h	7116.77	Gd II	30	7145.390	Ge II	10	7175.92	Ti III	100	7209.13	Be I
10 h	7116.8	La II	22	7145.54	Os I	10000 l	7176.22	Bk I	260	7209.44	Ti I
10000	7116.88	Pu I	1000	7147.042	Ar I	120	7176.66	P I	5	7209.96	Os I
10 h	7116.90	Pr I	18	7147.31	Gd II		7177.	Fr I	12	7210.67	Ce I
200	7116.99	C I	50 s	7147.50	Xe II	10000	7177.14	Pu I	9	7210.95	Sm I
23	7117.51	Sm II	16	7147.89	U I	130	7179.90	F II	130 h	7211.79	F II
15 c	7117.52	Ta I	33	7148.15	Ca I	6	7182.00	Ni I	11	7212.69	Th I
11	7118.24	Pr II	24	7148.15	V I	7	7182.08	V I	250	7213.13	Kr II
20	7118.50	Ra I	5	7148.560	Th I	380 w	7182.9	In II	150	7213.20	Ne II
21	7118.86	Gd II	150	7148.63	Ta I	4	7183.71	Ir I	11	7213.27	Dy I
19	7119.31	Nb I	200	7149.03	Xe II	4	7184.10	Os I	23	7213.82	Sm I
55	7119.52	Hf I	85 d	7149.60	Sm II	12	7184.25	Mn I	60	7216.20	Ti I
500	7119.60	Xe I	10	7149.77	La I	70	7184.89	Si I	5	7216.35	W I
26 h	7119.81	Sm II	10	7149.89	Os I	300 l	7184.93	Np I	19	7217.36	Ce I
350	7119.90	C II	19	7150.23	Ce II	6 h	7185.01	Nd	10	7217.50	Ti III
500	7120.05	I I	8	7151.03	Nd II	7	7185.52	Cr I	570	7217.55	Eu II
2400 h	7120.33	Ba I	7	7151.36	V I	80	7187.313	Fe I	10	7217.755	Th II
11	7120.81	Dy II	10	7151.67	Ce I	10	7187.48	Tb I	11	7218.054	Th I
20	7121.27	Ta I	6	7153.09	Nd I	10	7189.09	Nd II	26 d	7218.09	Sm II
1200	7122.05	I I	60	7153.09	Sr I	16	7189.40	Ce II	9	7219.06	Rh I
26	7122.20	Ni I	6 h	7154.40	Be I	24	7189.42	Nd II	6	7219.26	Ru I
12	7122.40	Sm II	40 h	7154.65	Be I	28	7189.57	Gd II	21	7219.91	La I
35	7122.57	Gd I	10	7154.954	Th I	10	7189.57	Sm II	13	7220.07	Sm I
15	7122.95	Nb I	16	7155.25	Ce I	55	7189.89	Ti I	30	7221.84	Eu III
15	7124.13	Ti III	11	7155.40	Er II	7 h	7189.95	Pr I	100	7224.104	Kr I
11	7124.562	Th I	210	7156.70	O I	15 h	7191.1	Te I	12	7224.51	Fe II
10	7124.73	Ce I	16	7156.99	Ce II	40	7191.132	Th II	11 h	7224.68	Eu I
30 b	7124.9	TiO	200 c	7157.62	Tc I	5 h	7191.33	W I	20	7225.16	Ra I
23 h	7125.11	Sm II	15	7157.72	Yb III	13	7191.35	Ta I	9	7225.55	Ti III
40bl	7125.61	TiO	40 h	7158.08	La I	17	7191.37	Nb I	4	7226.06	W I
40	7125.72	Ta I	13	7158.28	Gd I	20	7191.40	Sn II	100	7226.206	Si I
25	7125.820	Ar I	15	7158.839	Ar I	400 d	7191.66	I I	8 h	7227.01	Nd I
45	7125.84	Lu II	130	7159.43	Nb I	35	7191.66	Y I	3000	7227.13	Pa I
35	7126.17	Nb I	10 h	7159.88	Pr I	10	7191.72	Ce I	700	7227.30	I I
30000	7127.89	F I	50	7161.25	La I	20	7192.01	Nd II	24	7227.70	Pr II
11	7127.92	Y I	5	7161.91	Er I	100	7192.8	Br III	10	7228.02	Gd I
30	7128.90	U I	10	7162.60	LaO	10	7193.17	Mg I	200	7228.536	Cs I
5	7128.94	Pb I	9	7162.64	W I	65	7193.58	Si I	600 h	7228.84	Ba I
29	7129.35	Nd II	10000	7162.69	Cm I	5 h	7193.6	Ga I	20000	7228.965	Pb I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
17 h	7230.04	Dy I	4	7257.72	Tm I	7	7284.904	Th I	700	7314.30	F I
10000	7231.09	Pu I	40	7257.73	Tb I	9	7285.29	Nd II	5	7315.067	Th I
800	7231.32	C II	10000	7258.06	Pu I	15	7285.81	W I	15	7315.56	Ti I
5 h	7231.33	Tm I	12	7258.17	Zr I	11 h	7286.16	Tm I	25	7316.005	Ar I
13	7231.53	Pr I	15	7258.72	Eu I	9	7286.36	Ta I	14	7316.30	Ti III
250	7231.62	Pr III	7 c	7259.21	Pr I	80	7287.258	Kr I	300 c	7316.52	Rb II
200	7232.27	Sr I	2000	7260.45	Br I	7 c	7287.61	Pr I	10	7316.68	Ti III
25	7233.45	Gd I	9 d	7261.52	Sm II	9	7288.56	Nd II	12	7316.81	Nd II
8	7233.45	Ta I	7 h	7261.64	Nd II	16	7288.92	Sm II	13	7317.03	Nb I
5	7233.74	Tm II	5	7261.93	Ni I	400	7289.173	Si I	5 h	7317.63	Fe III
19 h	7234.98	Tb I	100 w	7262.32	Pr III	7 h	7289.19	Pr I	90	7318.08	Zr I
150	7235.19	Ne II	6	7262.62	Hf I	10	7289.26	Te II	26	7318.39	Ti I
100	7235.326	Si I	12	7262.64	Ce I	3 h	7289.6	Ga I	3000	7318.79	Pa I
16	7235.71	Ce II	28	7262.66	Gd I	400	7289.78	Kr II	20	7319.84	Ta I
60	7235.82	Si I	30	7262.77	Eu I	13	7290.23	Sm I	75	7320.05	Hf I
6 h	7236.20	Cr I	19	7263.40	Ti	55	7290.26	Si I	6 h	7320.14	Fe III
1000	7236.42	C II	20 h	7263.5	Te I	6	7290.40	Ac I	40	7320.70	Fe II
15	7236.54	Nd II	35	7264.17	Y II	20	7291.00	Rn I	10	7320.91	La I
10	7236.62	Te II	14	7264.29	V I	10	7291.06	Mg I	6	7320.98	Rn I
1000	7236.78	I I	35	7264.76	Zr I	14	7291.35	Gd I	7 h	7321.43	Nd I
50	7237.01	Cd II	7 h	7264.82	Er II	6	7291.38	Nd II	8	7321.44	V I
13	7237.02	Sm II	11 h	7264.82	Ta I	5	7291.45	Ni I	16	7321.76	Hf I
650	7237.10	Hf I	15	7265.172	Ar I		7291.47	Ca II	10000	7322.23	Pu I
8	7237.12	W I	19	7266.29	Ti I	300 l	7292.29	Np I	100	7322.38	Tc I
500	7237.84	I I	7	7266.96	Ru I	13cw	7292.72	Re I	11 c	7322.72	Ta I
14ch	7237.98	Lu I	10	7267.58	Hf IV	9 h	7293.08	Y I	7	7323.12	Nd II
100 w	7238.26	Pr III	22	7267.62	Mo I	11	7296.17	Ce I	8	7323.56	Ru I
22	7238.36	Ce II	100	7268.11	Rn I	13 c	7296.32	Ta I		7323.89	Ca II
35	7238.92	Ru I	18	7268.18	Rh I	15	7296.55	W I	17 c	7323.92	Nb I
250	7240.21	Pr III	19 b	7269.05	TiO	6 h	7297.56	Eu I	7cw	7324.42	Pr I
410	7240.87	Hf I	26	7270.09	La I	5	7298.143	Th I	7	7324.808	Th I
60	7240.90	Sm II	10	7270.30	La I	3	7298.25	W I	18	7324.89	Gd II
12	7241.73	Ce I	3	7270.558	Th I	7	7298.72	Nd II	13	7325.95	Ta I
9	7242.08	Ho I	7	7270.664	Ar I	17	7300.19	Mo I	10000	7325.97	Pu I
3	7242.355	Th I	12	7270.67	Ti III	3 h	7300.62	Sc I	400	7326.008	Cu II
150	7242.50	Mo I	35	7270.82	Rh I	26 h	7300.72	Sm II	33	7326.15	Ca I
7 c	7243.26	Pr I	12	7271.94	Rh I	540	7301.17	Eu II	50	7326.51	Mn I
9 h	7244.41	Yb I	6	7272.29	Ta I	19	7301.42	Ce II	13	7327.08	Sm II
130	7244.86	Ti I	17	7272.62	Tm I	140	7301.74	Ta I	10	7327.82	Zr I
100	7245.167	Ne I	2000	7272.936	Ar I	200	7301.80	Xe II	29cw	7328.38	Nb I
40	7245.85	Mo I	5	7273.03	Rh I	35 h	7302.89	Mn I	7	7328.47	Pr I
65cw	7246.67	Re I	5	7274.47	W I	180 c	7303.4	In II	80	7329.14	Tc I
10	7247.82	Mn I	15	7274.81	Nb I	5	7304.68	Pb I	14	7329.73	Er II
10000	7249.26	Bk	160	7275.294	Si I	8 h	7305.22	Yb I	25	7329.91	Ce I
13	7250.01	Dy I	8	7275.57	Sc I	11	7305.405	Th II	8	7330.15	Pb I
30 h	7250.27	Ta I	210 c	7276.5	In II	20	7306.21	Zr I	7	7330.38	Ge I
9	7250.60	Ho I	30	7276.96	Ta I	10000	7306.94	Bk I	9 h	7330.62	Y I
180	7250.625	Si I	5	7277.54	Ta I	10000 s	7307.90	Cf I	300	7331.694	Cu II
9	7251.16	Os I	11 h	7277.90	Ce I	50	7307.97	Fe II	10000	7331.81	Pu I
10 h	7251.4	Ga I	10	7278.24	W I	14	7308.55	Ho	5000	7331.96	F I
130	7251.72	Ti I	13	7279.25	Sm I	10	7308.69	Ca III	300 l	7332.52	Np I
50	7252.35	Nb I	60	7279.90	Cs I	1000	7309.03	F I	13	7332.65	Sm I
10000	7252.50	Bk I	200	7279.957	Cs I	2500	7309.41	Sr I	5	7332.96	Y II
14	7252.70	Gd II	100 l	7279.997	Rb I	100	7309.95	Lu III	110cw	7334.18	La I
25	7252.75	Ce I	3000	7280.30	Ba I	13 h	7310.06	Pd I	6	7334.54	Nd I
6	7253.49	Os I	8	7280.9	Te I	200	7310.25	Lu III	16	7334.68	Ce II
400	7254.15	O I	50	7281.35	He I	10	7310.27	Ra I	50	7335.97	Zr I
450	7254.45	O I	26	7281.47	Sm II	11	7310.46	Eu I	55cw	7336.18	Eu I
16	7254.45	U I	11 h	7281.53	Eu I	14	7310.51	Tm I	11	7336.63	Tm II
320	7254.53	O I	8	7282.21	Sm I	15000	7311.02	F I	120	7336.77	F III
2000 h	7254.58	Y III	110cw	7282.34	La II	10	7311.02	Yb III	8	7338.04	Sm I
180 c	7255.0	In II	40	7282.81	Si I	17	7311.57	Tb I	40	7338.92	V I
5	7255.354	Th I	19	7283.33	Sm II	25	7311.62	Zr I	200	7339.30	Xe II
70	7256.08	Tc I	24 h	7283.82	Mn I	35	7311.716	Ar I	5	7339.606	Th I
7500	7256.62	Cl I	7 h	7283.95	Er I	10 h	7313.05	Yb I	11cw	7340.19	Ta I
9	7257.11	Sm II	300 l	7284.28	Np I	21	7313.28	Gd I	150 w	7340.69	Pr III
10 b	7257.16	LaO	8	7284.30	Tm I	19	7313.45	Ce II	8	7341.152	Th I
10000 l	7257.21	Bk I	100	7284.34	Xe II	12	7313.63	Eu I	25	7341.43	Ho
12	7257.57	Sc I	100	7284.38	Cd II	35	7313.72	Zr I	12	7343.44	Ce I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
350	7343.70	Pr III	14	7376.41	Gd I	200	7405.36	Tc I	11 c	7435.19	Ta I
150	7343.94	Ne II	20	7376.46	Fe II	375	7405.774	Si I	25	7435.368	Ar I
50	7343.96	Zr I	26	7376.69	Sm II	160	7406.12	N I	200	7435.78	Kr II
120	7344.72	Ti I	13	7377.27	Gd II	265	7406.24	N I	15	7436.02	Nb I
7	7344.86	Pr	50bl	7379.71	LaO	10	7406.62	Nd II	10	7436.297	Ar I
17	7345.13	Dy II	12	7379.96	Ti III	400	7407.02	Kr II	21 h	7436.59	Eu I
65	7345.34	La I	85bl	7380.08	LaO	16	7407.56	Pr II	25	7437.56	Hf I
1000	7345.670	Cd I	13	7380.28	Gd I	11	7407.59	Dy I	11	7438.56	Ce I
4	7346.25	Eu I	20	7380.426	Ar II	160	7407.89	Ta I	110	7439.86	Zr I
40	7346.37	Hg II	10 h	7381.	Bi III	9	7407.95	Os I	5	7439.95	Tm II
160	7346.41	Ta I	10 h	7381.	Bi II	10	7408.13	Ti III	23	7440.17	Ta I
50	7346.46	Y I	300 l	7381.03	Np I	150	7408.173	Rb I	26	7440.60	Ti I
10	7346.676	Pb I	300 l	7381.65	Np I	1	7408.62	Sn II	11 c	7441.52	Lu I
26	7347.30	Sm I	7	7381.79	Nd II	200	7409.082	Si I	35	7441.85	Gd I
13	7348.49	Mo I	250	7382.277	Cu II	16	7409.35	Ni I	785	7442.29	N I
10000	7348.51	Br I	35	7382.73	La I	5	7409.70	Lu II	18 h	7442.39	Rh I
45	7348.88	Tb II	25	7383.63	Zr I	80	7410.01	Yb III	30 b	7442.92	LaO
5 h	7349.3	Ga I	10000	7383.980	Ar I	1000	7410.50	I I	200	7443.657	P IV
200	7349.75	Pr III	5	7384.175	Th I	6	7411.20	Nd II	12	7444.44	Ce I
16 h	7350.04	Yb I	7	7384.208	Ge I	50 b	7411.34	LaO	30	7444.56	Sm I
320 c	7350.6	In II	7	7385.08	W I	10	7411.39	Zr I	3	7444.749	Th I
300 w	7350.61	Pr III	4	7385.24	Ni I	15	7412.337	Ar I	10	7445.39	Te II
5	7350.814	Ar I	18	7385.501	Th I	24	7412.37	Dy I	26	7445.41	Sm I
500	7351.35	I II	9	7385.95	V I	5000	7414.11	Cl I	30	7445.746	Fe I
11	7352.16	Ti I	100	7386.00	Xe I	5	7414.51	Ni I	7	7446.77	Rh I
140 c	7352.86	Ta I	5 h	7386.64	Rh I	40	7415.35	Si I	13	7447.34	Mo I
65 c	7353.16	Nb I	5	7387.00	Mg I	275	7415.946	Si I	10000	7447.99	Pu I
70	7353.293	Ar I	4	7387.36	Eu I	500	7416.48	I I	25	7448.28	Yb I
5	7353.334	Ge I	12	7387.69	Mg I	8	7417.38	Co I	9	7448.71	Nd II
130	7354.94	F III	10	7387.79	Sn II	300	7417.53	Ba I	90	7449.16	Sc III
18	7355.37	Er I	12	7389.16	Eu I	12	7417.94	Ce II	300	7450.00	Rn I
100 w	7355.52	Pr III	18	7389.40	Ho	10	7418.18	Nd II	29	7450.30	Y II
85	7355.90	Cr I	20	7390.70	Hf I	3	7418.550	Th I	4	7451.39	W I
6	7356.10	Hf I	40	7391.36	Mo I	10	7419.04	Rn I	20 c	7451.74	Pr II
11	7356.34	Er I	27	7391.92	Pd I	13	7419.83	Nb I	600	7452.49	Tc I
35	7356.54	V I	1200	7392.41	Ba I	23	7422.28	Ni I	13 h	7452.85	Mo I
4	7356.65	Eu I	20	7392.980	Ar I	10	7422.75	Zr I	26 d	7453.03	Sm II
100	7356.96	Ta I	3	7393.431	Th II	425	7423.497	Si I	3	7456.37	W I
6	7357.10	Nd I	6 h	7393.49	V	685	7423.64	N I	15	7456.86	Yb III
90	7357.74	Ti I	16	7393.60	Ni I	6	7423.69	Hf I	8	7456.96	Lu II
11	7358.66	V I	150	7393.79	Xe I	15 h	7424.24	Tb II	20	7457.05	Dy II
20	7359.96	Ag I	16	7393.93	Ru I	85	7424.60	Si I	10	7457.85	Ti III
5	7361.349	Th I	13	7393.98	Sm II	11	7424.70	CeO	55	7459.55	Er I
24	7361.39	V I	10000	7394.26	Bk	10	7425.294	Ar I	900 h	7459.78	Ba I
110	7361.57	Al I	13	7394.90	Gd II	23	7425.50	U I	9	7460.42	Er I
13	7361.65	Mo I	100	7396.80	Tc I	60	7425.541	Kr I	12	7460.98	Te II
11	7362.25	Eu I	25	7397.77	Ce I	4000	7425.65	F I	60	7461.59	Tc I
140	7362.30	Al I	10	7398.27	Tb II	2000	7426.48	Pr III	50	7461.59	Th III
12	7362.49	V I	20 h	7398.6	Sn I	300	7426.57	Eu II	5 h	7461.89	Si III
24	7363.16	V I	210	7398.64	N I	55	7426.86	Dy II	150	7462.31	Cr I
60	7364.11	Ti I	10000	7398.69	F I	60	7427.15	Tc I	550	7462.370	Cl I
10 h	7364.41	Mo I	11 h	7398.77	Y I	9	7427.41	Nd II	20	7462.38	Fe II
6	7365.28	Hf I	10	7399.98	Yb III	18	7428.67	Er I	8 h	7462.62	Si III
75	7368.12	Pd I	130	7400.21	Cr I	21	7428.940	Th I	2	7462.993	Th I
10000 l	7368.25	Pa I	14	7400.90	Zr I	4000	7429.05	Pr III	50 h	7463.08	La I
90cw	7369.09	Ta I	3	7401.20	Be II	10 h	7429.62	Tb II	13	7463.86	Hf I
55cw	7369.60	Eu I	11	7401.27	Ce I	13	7430.19	Gd I	100	7463.96	Pr III
720	7370.22	Eu II	9	7401.31	Nd I	10	7430.254	Th I	30 h	7464.0	Ga I
11	7370.23	Dy II	2	7401.43	Be II	9	7430.80	Rh I	40	7464.36	Gd I
300 s	7370.60	Np I	5000	7402.06	I I	10000	7431.18	Pu I	50bl	7465.25	LaO
200	7372.118	Ar I	5	7402.252	Th I	14	7432.18	Tm I	95bl	7465.48	LaO
190cw	7372.50	Nb I	100 c	7402.61	Tc I	12	7433.08	Ce I	9 h	7466.32	Si III
35	7373.00	Si I	6	7402.64	Ge I	10	7433.10	Zr I	18	7467.57	Zr I
20	7373.50	Zr I	300 l	7402.70	Np I	10	7434.10	Mo I	30	7467.75	Ta I
14	7373.81	Gd I	20 h	7403.0	Ga I	150	7434.12	Tc I	900	7468.31	N I
6	7374.04	Nd II	110bl	7403.52	LaO	270	7434.156	Cu II	15	7468.75	Te II
6	7375.07	Os I	210bl	7403.75	LaO	65bl	7434.28	LaO	18	7468.91	Ru I
9	7375.57	Rh I	1000	7404.354	Cu II	110bl	7434.36	LaO	5000	7468.99	I I
20	7376.04	Dy I	11 h	7404.41	Eu I	5	7434.51	Tm II	120	7469.51	Er I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
8	7470.53	Eu I	2	7502.33	Bi I	10	7538.26	Nd II	9	7566.25	Ti III
13	7470.76	Sm I	23 h	7502.39	Sm II	6 h	7539.18	Er I	18	7567.740	Th I
8	7470.89	Rn I	20000	7503.869	Ar I	85	7539.23	La I	6	7569.23	Ta I
3000 h	7471.89	Pa I	7	7504.13	W I	800	7540.26	Tc I	17	7569.92	W I
9	7472.15	Tb I	13	7504.47	Mo I	20 h	7540.62	Zr I	23	7570.95	Sm II
10	7472.41	Ce I	100	7505.76	P I	5	7540.97	Nd II	10000	7571.87	Pu I
40	7472.439	Ne I	30 b	7506.79	LaO	14	7541.02	Pr II	23	7572.29	Sm II
9	7474.94	Ti I	15	7506.87	Ti III	23 h	7541.42	Sm II	11	7572.64	Mo I
12	7475.40	Ru I	10 h	7507.28	Tm I	8	7542.02	Rh I	10000	7572.93	Pu I
12	7475.74	Rh I	17	7507.68	Ti III	80	7543.39	Tc I	5000	7573.38	F I
210	7476.44	O I	10000	7507.80	Pu I	55	7543.73	Dy I	200	7574.02	Tc I
100	7477.24	O I	10	7509.00	W I	60	7544.044	Ne I	8	7574.05	Ni I
19	7478.20	Nb I	600	7510.73	Au I	12	7544.29	Ti III	6 h	7574.21	Er I
200	7478.8	Zn II	10 h	7510.74	Ho I	20	7544.59	Zr I	15 h	7574.44	Sc I
120	7479.08	O I	60	7511.045	Fe I	9	7544.74	Sm I	170 c	7574.58	Nb I
16	7479.58	Zr I	12	7511.16	Nd II	14	7545.78	Tm I	6	7574.86	Pr I
120	7480.67	O I	100	7511.17	Pr III	300 l	7546.05	Np I	200	7575.1	Se I
75	7481.08	Tm I	10000 l	7511.26	Bk I	10	7546.57	Sm I	30	7575.81	Ca II
10	7481.26	Te II	27	7511.40	Tb I	7	7547.00	Nd II	11	7576.95	Hf I
5	7481.28	Nd II	7	7511.57	Ge I	11000	7547.072	Cl I	8	7577.22	Rh I
10	7481.355	Th I	300 s	7512.22	Np I	6	7547.32	Eu I	20 h	7577.46	Dy II
26	7481.99	Sm II	40000	7512.96	Br I	10000	7547.45	Pu I	5	7577.54	Nd II
2200	7482.72	F I	17	7513.73	Nd II	70	7548.15	Sc III	10000	7577.80	Cm I
8	7483.13	Rn I	8	7514.13	Rn I	300	7548.45	Xe II	19	7578.09	Sm II
8	7483.35	W I	7 h	7514.44	Nd II	100 w	7549.20	Pr III	40cw	7578.73	Re I
75cw	7483.50	La II	15000	7514.652	Ar I	7	7549.314	Th I	12 h	7578.75	V I
22	7484.54	Tb I	900	7514.92	F I	9	7550.48	W I	450	7579.0	S I
7	7484.56	Hf I	300 l	7515.15	Np I	12	7551.	Bi III	500	7579.26	Tc I
140	7485.74	Mo I	14 h	7515.70	Zr I	10000	7551.12	Bk I	10000	7579.77	Bk I
26	7485.79	Ru I	65	7515.93	Nb I	10	7551.25	Ce I	12	7580.55	Ti I
100	7485.87	Hg II	7	7516.02	Nd II	29	7551.46	Zr I	17 h	7580.61	Tm I
12 h	7485.90	V I	17	7516.61	Dy II	10	7551.90	Be I	4	7580.76	Mg II
23	7486.01	Ta I	8	7516.92	Rn I	5000	7552.24	F I	60	7581.11	Ca II
16	7486.57	Ce II	10 h	7517.00	Sm II	17 h	7553.00	Dy I	27 h	7582.03	Tb II
100	7486.862	Kr I	12	7517.46	Hg III	14 h	7553.96	Sc I	5	7582.88	W I
16	7486.90	Pd I	12	7517.95	Zr I	2000	7554.18	I I	17 c	7583.21	Nb I
250	7487.40	Pr III	29 c	7519.77	Nb I	40	7554.70	Zr I	250	7583.4	Se I
600	7488.08	Ba I	9	7519.77	Tb II	140	7555.09	Ho I	160	7583.91	Eu I
12 h	7488.08	V I	30	7520.56	Ta I	19	7555.60	Ni I	200	7584.68	Xe I
90	7488.871	Ne I	3	7520.66	W I	27	7556.26	Er I	12	7585.69	Th I
2500	7489.16	F I	13	7522.76	Ni I	15	7556.37	Hf I	12	7585.792	Th I
550	7489.47	Cl I	150	7522.82	Ne II	6 h	7556.6	Ga I	30	7585.85	Sm II
26	7489.61	Ti I	10	7523.85	Ti III	500 d	7556.65	I I	15	7586.04	Fe I
75	7490.20	Tm I	6	7523.93	Rn I	10	7556.8	Te I	1000	7587.411	Kr I
500 c	7490.52	I I	12 h	7524.13	Sc I	6	7557.59	Tb II	27	7587.49	Tb I
5 h	7491.00	Eu I	300	7524.46	Kr II	11	7557.67	Rh I	7	7587.65	Nd II
9	7491.37	Ti IV	9	7525.12	Ni I	3000 h	7558.26	Pa I	10	7588.20	Gd I
100	7492.10	Ne II	50	7525.508	Th II	140	7558.33	Tm I	23	7588.31	Sm II
700	7492.118	Cl I	9	7526.45	Nd II	25	7558.45	Zr I	300	7588.5	Zn II
12 h	7492.44	V	10000	7526.93	Pu I	9000	7558.71	Y III	150 w	7588.64	Pr III
10000 h	7493.15	Pa I	11	7527.46	Ce I	10	7558.97	Pb II	18	7589.20	Ho I
200	7493.20	Pr III	30 h	7527.46	Yb I	26	7559.61	Ru I	9bl	7589.62	TiO
2	7493.427	Th I	11	7527.68	Ce I	27	7559.78	Dy I	9	7590.22	Ta I
3	7493.6	Tl I	19bl	7528.21	LaO	12 h	7560.03	Sm II	45	7590.24	Tb I
8	7494.77	Ti IV	50bl	7528.39	LaO	35bl	7560.09	LaO	5 h	7590.51	Er I
17	7494.88	Y I	50cw	7528.70	Eu I	12	7560.09	Zr I	6	7590.75	Nd II
40	7495.059	Fe I	12	7528.99	Nd II	500	7562.015	Cu II	9 h	7591.24	V I
12	7495.24	Rh I	500	7529.11	Pr III	12	7562.12	Zr I	27 h	7591.30	Dy I
9	7495.45	Tb I	7	7532.07	Ru I	12	7562.44	Ce I	1600	7591.61	Br I
11 h	7495.59	Pr I	22	7532.34	Er I	10	7562.86	Ce I	25	7591.87	Ho I
45	7496.12	Tb I	5 h	7533.02	Eu I	75	7562.93	Hf I	150	7592.2	Se I
19	7496.12	Ti I	30	7533.59	La I	19	7562.94	Sm II	35bl	7592.26	LaO
5 h	7496.20	Ho I	10	7533.73	Ce I	40	7562.96	Dy II	11	7592.96	Hf I
40bl	7496.50	LaO	45	7533.93	U I	55	7562.97	Gd I	9 h	7593.64	Ho I
95bl	7496.78	LaO	50	7534.27	Lu III	35	7563.13	Y I	20 h	7593.74	Tm I
50	7498.83	La I	80	7534.95	Tc I	10	7563.19	Gd II	7 h	7594.35	Ho I
6 h	7499.42	Pr I	80	7535.774	Ne I	10 h	7563.60	Ce I	1800	7595.07	Br I
17	7499.69	Tb II	7 h	7536.71	Y I	15	7564.22	Hf I	17	7595.07	Tm II
70	7499.75	Ru I	9	7537.45	W I	10000	7564.50	Pu I	11 h	7595.16	Mo I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
3	7595.51	V V	18	7621.50	Ru I	22	7654.45	Er II	8	7690.16	Mg I
300	7596.41	Pr III	500	7621.50	Sr I	4 h	7654.56	Si IV	20	7690.43	Ho I
65	7596.44	Tb I	21	7621.96	Gd I	3	7654.81	W I	20	7690.44	Eu III
14 h	7596.92	V I	19 h	7622.94	Y I	17	7655.00	Tm I	18	7690.83	Zr I
11	7597.33	Er I	6	7623.48	Er I	10	7655.78	Sm II	15	7691.55	Mg I
6	7597.55	Rn I	22 h	7624.05	Tb I	17 h	7656.76	Mo I	50 c	7693.15	Ho I
25	7598.	Bi III	360	7624.40	Hf I	10	7657.48	Rn I	13	7694.45	Gd I
10	7598.01	Sm I	90	7624.53	Tc I	20	7657.60	Mg I	1200	7694.538	Kr I
4	7598.204	Th I	24	7624.81	V I	12 h	7658.05	Er I	8 h	7694.74	Tb II
12 h	7598.28	V I	300 l	7624.83	Np I	4	7658.324	Th I	10 h	7695.78	Sm I
17 h	7601.18	Tb II	19 b	7624.99	LaO	29	7658.60	Zr I	12	7696.56	Nd II
8	7601.28	Rn I	100 w	7625.63	Pr III	19	7659.15	Mg I	450	7696.7	S I
80	7601.30	Ca II	10000	7626.79	Pa I	22	7659.25	Er I	500	7697.37	Tc I
2000	7601.544	Kr I	300	7626.85	Np I	17	7659.90	Mg I	30	7697.73	Sc I
11	7601.84	Mo I	5	7627.176	Th I	150	7660.26	Al III	8 h	7698.00	Y I
12	7602.31	Ho II	30	7627.81	Tb I	4	7660.32	Tm I	80 c	7698.19	Tc I
20	7602.32	Ca II	14	7627.98	Ho I	80	7662.36	Dy I	24	7698.96	K I
26	7602.95	Os I	40 c	7628.42	Ho I	6	7663.52	Nd II	750	7699.48	Yb I
10	7603.10	Ce I	450	7629.8	S I	21	7664.34	La I	2000 c	7700.20	I I
6	7603.73	Nd II	5	7629.85	Tm I	70	7664.41	Yb III	4	7701.01	W I
16	7605.35	Ho I	2 h	7630.50	Si IV	1000	7664.648	Cu II	5	7701.37	V I
5	7605.92	Nd II	3	7631.29	W I	25	7664.90	K I	4	7701.46	Os I
60	7606.16	Al I	10 h	7631.77	Sm II	4	7665.64	Er I	8 h	7701.46	Tm I
120	7606.8	Se I	10	7632.56	Pb II	14 h	7665.72	Sc I	450	7702.828	Cl I
80	7607.15	Zr I	100 c	7632.7	In II	7 h	7666.24	Tm I	25	7703.33	Nb I
7000	7607.17	F I	25000	7635.106	Ar I	11	7666.78	Dy II	14	7704.27	Zr I
6	7607.23	Er I	10000 s	7635.18	Pa I	19	7667.20	Sm II	8	7704.81	V I
23 d	7607.48	Sm II	220 h	7635.37	Al III	12 c	7667.30	Ho I	7	7704.98	Pr II
	7607.74	Sm I	3	7636.176	Th I	10000	7669.34	Pa I	11bl	7705.21	TiO
2	7607.824	Th I	450 h	7636.90	Ba I	100 w	7670.65	Pr III	22 h	7706.16	Tb II
10000 h	7608.20	Pa I	10 h	7637.	Bi II	200	7670.66	Xe II	100	7706.75	O I
13	7608.59	Hf I	10 h	7637.	Bi III	1800	7672.09	Ba I	8 h	7706.85	Ti IV
185	7608.80	N I	23	7637.94	Sm II	2300	7672.42	Cl I	10	7708.42	Zr I
150 c	7608.903	Cs I	9 h	7639.05	Tb II	8	7672.49	Sm II	4	7710.269	Th I
10000	7609.77	Pu I	9	7639.79	Nd II	25	7672.56	Gd I	15	7711.71	Fe II
13 h	7611.55	Dy I	13	7639.81	Nb I	8	7672.72	Tb II	23	7712.04	Sm II
10	7611.78	Gd I	7ch	7640.08	Lu I	400 h	7673.06	Sr I	10	7712.42	Mn I
13	7611.89	Re I	50cw	7640.94	Re I	100	7673.1	Br III	8	7712.68	Co I
14	7612.08	Zr I	35 h	7641.09	Dy I	10000	7673.79	Cm I	16	7714.32	Ni I
3	7612.18	W I	9 c	7641.14	Ho I	200 w	7674.65	Pr III	40cw	7715.06	Ho I
12 h	7612.36	Si III	150	7641.16	Kr II	8	7676.04	Tm II	35	7715.33	Dy I
150	7612.65	C III	500	7642.02	Xe I	10	7676.06	Gd I	5 h	7715.58	Ni I
100	7612.9	Zn II	600 h	7642.91	Ba I	7	7676.219	Th I	7000	7717.581	Cl I
19 h	7612.94	La II	100	7643.91	Xe I	4 h	7678.75	Si IV	6	7718.20	Nd II
5	7612.94	Ru I	45	7645.09	Sm II	10 h	7678.79	Sm II	5 h	7718.79	Si IV
11	7613.52	Er I	20	7645.64	Hf I	2	7678.93	Tl I	16	7719.05	Ho I
12	7613.94	Sm II	20	7645.66	Pr II	3000	7679.20	Pa I	19	7719.89	Y I
17	7614.15	W I	16 h	7645.67	Er I	13	7679.49	Mo I	10000	7720.47	Cm I
15	7614.50	Ti I	12	7645.82	Sm I	35	7680.01	Er I	27	7720.77	Mo I
5	7614.72	Nd I	17	7645.86	Dy I	12	7680.20	Mn I	16	7721.84	Pr I
90	7614.82	Al I	8	7646.00	Nd II	100	7680.267	Si I	11 h	7722.02	Ta I
17	7616.01	Tb II	12	7646.08	Ce I	300 s	7681.01	Np I	9	7722.14	Er I
25	7616.11	Ce II	13	7646.64	Dy I	150	7681.788	Cu II	1	7722.61	Mg I
2000	7616.41	Br I	30	7647.380	Th I	220	7681.97	Al III	18	7722.87	Ru I
23	7617.00	Ni I	13	7647.71	Nb I	12	7682.47	Ce I	15000	7723.761	Ar I
12	7617.05	Ho I	10	7647.88	Ce I	100 c	7682.9	In II	6 h	7723.82	Si IV
11	7617.45	Sc I	19	7648.02	Sm II	100	7684.45	Tc I	19	7724.08	Y I
11 h	7617.70	Dy I	4	7648.16	Ho I	1000	7685.244	Kr I	10000	7724.207	Ar I
8 h	7617.72	Y I	30 h	7648.28	Sb I	300 s	7685.25	Np I	100	7724.628	Ne I
60 w	7618.46	N V	100 w	7648.34	Pr III	30	7685.30	Sn I	2 h	7725.64	Si IV
80	7618.57	Xe II	5 h	7648.76	Tm II	21	7685.305	Th I	8	7726.19	Er II
10 h	7618.68	Be I	6	7649.62	Ta I	285	7686.1	S I	90 w	7726.2	C IV
20 h	7618.88	Be I	21	7650.32	Gd I	320	7687.78	Ag I	75 c	7726.68	Nb I
200 l	7618.933	Rb I	8	7650.63	Er I	6	7688.61	Te II	22 h	7726.97	Tb II
9	7619.21	Ni I	5 h	7652.12	Ti IV	13	7688.97	W I	19	7727.61	Ni I
16	7619.35	U I	700	7652.333	Cu II	25	7689.17	Ce II	30	7728.56	Sm II
7cw	7620.25	Re I	7	7652.89	Y I	10000	7689.40	Pu I	20	7728.82	Hg I
10 h	7620.5	Ga I	14 c	7653.80	Ho I	5	7689.49	Y I	4	7728.951	Th I
20	7621.17	Zr I	23	7654.44	Ti I	11	7690.05	Rh I	18	7729.72	Sc I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
45	7729.76	Dy II	4	7762.16	Er I	10	7799.36	Zn I	5 h	7833.39	Ru I
5	7729.91	Ru I	450	7762.24	N II	30	7800.008	Si I	10	7833.575	Ge I
10000 l	7729.93	Bk I	11	7763.11	Ta I	100 h	7800.01	Ga I	6	7834.32	Ir I
1 h	7730.47	Si IV	120	7764.03	Pd I	15000	7800.21	F I	8	7834.459	Th II
80	7731.53	Tm I	10 h	7764.72	Mn I	90000 c	7800.27	Rb I	40 w	7835.08	Sm II
10	7731.72	Th II	1000 l	7765.75	Np I	30	7800.44	Sc I	110	7835.25	B III
10	7732.33	Ce I	10	7766.48	Gd II	10	7801.54	Sm I	230	7835.31	Al I
300	7732.5	Zn II	10	7766.55	Zr I	4 h	7801.6	Ga I	290	7836.13	Al I
4	7732.96	Pb II	2200	7769.16	Cl I	6	7802.52	Y I	26	7837.27	Sm II
80	7733.50	Gd I	6 h	7771.06	Sc I	100	7802.65	Xe I	7	7837.63	Ge I
50 h	7734.77	Ga I	650	7771.09	Cl I	30000	7803.02	Br I	20	7838.12	Ra I
1000 l	7735.14	Np I	870	7771.94	O I	8 h	7803.32	Eu I	3	7838.70	Bi I
250	7735.69	Kr II	4	7771.948	Th I	17	7803.93	Tm I	9	7838.80	Er I
30	7736.26	Sm II	18	7772.90	Rh I	750	7805.184	Cu II	300	7839.055	Ne I
30	7737.63	Tb I	6	7773.06	Nd II	70 c	7806.8	In II	180 h	7839.57	Ba I
10	7738.43	Rn I	810	7774.17	O I	4	7806.82	Ru I	2	7840.33	Bi I
16 h	7738.98	Ho I	750	7775.39	O I	8	7807.33	Tb II	90 c	7840.9	In II
700	7739.04	Ce III	300 s	7776.07	Np I	1500	7807.659	Cu II	6cw	7841.27	Pr I
110	7740.17	Hf I	5	7776.20	Ge I	7	7808.10	Hg III	70	7841.41	B III
210 c	7740.7	In II	3	7776.73	W I	10	7808.47	Nd II	15 h	7841.80	La I
120	7740.74	Ne II	100 c	7776.96	In II	7	7808.96	W I	6 h	7841.90	Ru I
55 h	7741.17	Sc I	4 h	7778.27	Tm I	20	7809.259	Pb I	12	7842.59	Ce I
13	7741.80	Sn II	800	7778.738	Cu II	4	7809.78	Na I	20 c	7842.76	Ta I
500	7742.34	Pr III	9 c	7779.67	Ta I	100	7809.82	Rn I	10	7843.06	Ca III
60cw	7742.57	Eu I	1200	7780.48	Ba I	3	7810.24	Na I	60	7843.38	Ca II
40	7742.71	Si I	30	7780.59	Fe I	4	7810.625	Th I	11	7844.00	Er I
8	7743.57	Hf I	3000	7781.98	Pr III	3	7811.14	Mg I	80	7844.44	Sb I
4	7743.90	Nd II	12 h	7782.35	Tm I	35	7812.06	Dy I	10	7844.82	Sm II
450	7744.097	Cu II	11	7784.15	W I	17	7812.16	Y I	11 h	7844.87	Gd I
10000	7744.97	Cl I	15	7785.17	Sc I	8 h	7812.75	Sm II	22	7844.94	Ce II
250 w	7745.59	Pr III	8 h	7785.51	Tm I	3	7813.43	Ru I	310	7845.35	Hf I
70	7746.19	Eu I		7785.90	Tm I	70 c	7814.5	In II	250	7845.63	P II
1	7746.34	Mg I	6 h	7786.16	Pr II	35	7814.55	Hf I	10	7845.80	Gd I
20	7746.64	Rn I	5	7786.50	Mg II	200 w	7814.74	Pr III	35	7846.35	Gd II
150	7746.827	Kr I	27	7786.67	Pd I	60cw	7815.48	Ho I	15	7846.50	Rh I
11 h	7747.44	Er I	60	7787.04	Xe II	10	7815.80	Tl I	7	7846.56	Hf I
16	7748.35	Ce I	6	7787.11	Nb I	7 h	7815.9	Lu I	15	7847.540	Th I
19	7748.89	Ni I	300	7787.46	Np I	1	7816.15	He I	16	7847.55	Er I
4	7748.92	Nd II	15	7787.79	Th II	12	7816.32	Zr I	30	7847.80	Ru I
10000 h	7749.19	Pa I	13	7788.42	Y I	60	7816.74	Tc I	400	7848.80	Si II
35	7749.30	Gd I	15	7788.937	Th I	800	7817.72	Tc I	90	7849.35	Zr I
30	7749.30	Sm II	10	7788.94	Ni I	21	7817.771	Th I	500	7849.72	Si II
10	7750.	Bi II	180 c	7789.0	In II	5	7817.97	Pb I	30	7849.967	Si I
5 h	7750.37	Sc I	7	7789.96	Os I	8	7818.21	Eu I	50 h	7850.00	Sr I
10	7750.95	Nd II	40	7790.90	Hf I	8	7818.79	Te II	16	7850.02	Ce II
20	7751.29	Hf IV	4	7790.98	Mg II	7	7818.83	Nd II	16	7851.18	Ce II
20	7751.62	Dy II	1000 l	7791.38	Np I	110	7819.35	Zr I	8 h	7851.18	V
8 c	7752.01	Ho I	29	7791.61	Rh I	16	7820.15	Sm II	300 l	7851.44	Np I
5	7752.72	Sc I	22	7791.86	Ru I	40	7820.78	Ca II	7	7852.17	Os I
1 h	7752.91	Si IV	7	7792.22	Nd II	2200	7821.36	Cl I	6	7853.77	Ge I
500	7754.31	Pr III	2	7793.0	Ga II	11	7821.64	Sc I	15	7854.45	Mo I
22	7754.63	Er I	800 c	7793.04	Tc I	35	7822.94	Zr I	800	7854.821	Kr I
18000	7754.70	F I	22	7793.20	Tb I	40cw	7823.63	Ho I	29	7855.52	Y I
100	7754.97	Sn I	10	7794.50	Sm I	2	7823.82	W I	30	7855.79	Tb II
23	7755.20	Sm II	8	7794.68	Sc I	55	7824.91	Rh I	40	7856.08	Tm I
100 w	7755.48	Pr III	13	7796.32	Y I	5	7825.20	Nd II	100	7856.38	Tc I
10	7755.97	Gd I	6	7796.40	Nd II	1000	7825.654	Cu II	35	7856.93	Gd I
25	7757.31	Nb I	9	7796.69	Er I	40	7826.72	Zr I	22	7857.54	Ce II
300	7757.651	Rb I	7	7796.81	Hf I	500	7826.80	Ce III	6	7859.53	Sm I
5	7757.89	Hf II	8	7797.32	Nd II	1200	7827.23	Br I	350	7860.577	Cu II
200	7757.9	Zn II	35	7797.47	Er I	6	7829.01	Pb I	200	7860.89	C I
10000	7758.20	Pu I	13	7797.59	Ni I	4	7829.22	Tm I	200	7861.44	Tc I
300	7758.27	Ce III	10	7797.70	Ce I	17	7829.65	Mo I	8	7861.61	Te II
7cw	7758.30	Lu I	4	7797.89	Ru I	4	7829.81	Ru I	3	7861.67	Tm I
15	7759.1	Te I	60	7798.28	Tc I	15	7830.05	Rh I	12	7863.04	Nd II
1	7759.30	Mg I	5	7798.32	Nd II	1700	7830.75	Cl I	4	7863.47	W I
60	7759.436	Rb I	5	7798.360	Th I	10	7831.40	Sm II	19	7863.65	Sm II
5	7761.16	W I	10000	7798.54	Pu I	40	7832.22	Fe I	4	7864.023	Th I
300 l	7761.61	Np I	500	7798.98	I II	16	7832.91	Tb II	12	7864.49	Ce I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
6000	7864.53	Y III	10	7897.98	Zr I	2100	7933.89	Cl I	40	7964.83	La I
15	7864.99	Tb I	12	7898.46	Ca III	10	7934.50	Ce II	20	7965.	Bi II
14bl	7865.51	VO	500	7898.59	F I	1700	7935.012	Cl I	70	7965.45	Tc I
12	7865.95	Th I	14 h	7898.81	V	350	7936.31	F I	12	7965.73	Nd II
10	7866.04	Ce I	16	7898.96	Ce II	70 l	7936.45	Lu III	500	7967.34	Xe I
6 l	7866.10	Ac I	2300	7899.31	Cl I	700	7936.996	Ne I	450	7967.4	S I
1500 w	7866.14	Pr III	18	7899.55	Er I	19	7937.09	Sm II	450	7967.4	S II
30 h	7866.90	Sr I	11	7900.31	Th I	80	7937.131	Fe I	9	7967.84	Ru I
2	7867.04	W I	9	7900.40	Nd II	4	7937.732	Th I	11	7968.63	Dy I
70	7868.65	Sc III	300 l	7901.71	Np I	30	7937.84	Er I	500	7969.48	I I
14	7869.72	Gd I	700	7902.553	Cu II	24	7937.92	V I	40 h	7969.55	Sb I
35	7869.99	Zr I	10000 s	7903.90	Bk I	29	7938.06	Hf I	35	7970.306	Si I
400 d	7871.25	Tc I	3	7904.00	Sn II	30000 c	7938.68	Br I	18	7970.46	U I
14	7871.67	Pr I	290	7905.51	Al III	25	7938.89	Nb I	100	7971.46	Yb III
5 h	7872.03	Nd I	1500	7905.75	Ba I	20	7940.47	Zr I	6	7971.56	Tm I
3000	7872.95	Pa I	5 h	7906.03	Nd I	9	7940.92	W I	400	7972.033	Cu II
13cw	7873.41	Nb I	16	7908.46	Zr I	11	7941.72	Th I	7	7972.598	Th I
20 h	7874.00	Sr I	7	7908.71	Co I	11 h	7942.04	Cr I	1000 w	7972.75	Pr III
60 c	7874.76	Tc I	27	7909.38	Dy I	15	7943.14	Te II	20	7972.9	Te I
5	7875.36	Er I	75bl	7910.19	LaO	100	7943.15	O I	120	7973.62	Kr II
14	7876.25	Zr I	150bl	7910.54	LaO	2000	7943.181	Ne I	1500	7974.72	Cl I
21 b	7876.87	LaO	600	7911.34	Ba I	300	7943.882	Cs I	300 l	7975.98	Np I
12	7877.05	Mg II	65cw	7912.94	Re I	140	7944.001	Si I	1300	7976.97	Cl I
75bl	7877.22	LaO	8	7913.08	Er I	400	7944.438	Cu II	8000	7978.44	Br I
7	7878.12	Ge I	6	7913.11	Tb I	50 b	7944.61	LaO	10000	7978.57	Br I
3000	7878.22	Cl I	200	7913.423	Kr I	160	7944.61	Zr I	60	7978.88	Ti I
300	7879.18	F I	11	7913.52	Ce I	100	7944.66	Hg II	24	7978.974	Th I
8 h	7879.22	Ho I	1000	7914.00	Pr III	110bl	7944.95	LaO	8	7979.03	Er II
5	7879.36	Er I	26	7914.96	Sm II	3000 l	7945.56	Pa I	9	7979.07	Ti I
10 h	7880.01	Sm II	1800	7915.08	Cl I	60	7945.984	Fe I	35 b	7979.34	LaO
4	7880.40	W I	6	7915.19	Pr II	25	7946.75	Hg III	75bl	7979.70	LaO
6	7881.09	Pr I	45	7915.80	Pd I	100	7947.17	O I	600	7980.60	Cl I
100	7881.32	Xe I	8000	7916.71	Y III	235	7947.55	O I	35cw	7980.77	Re I
2500 s	7881.45	Br I	12	7917.01	Nd II	45000 c	7947.60	Rb I	8	7980.87	Er I
80	7881.49	Ru I	2	7917.44	Ni I	5	7947.93	Nd II	6	7981.20	Os I
2500	7881.57	Br I	5	7918.10	Tm I	3000	7947.94	Br I	110	7981.94	O I
2	7881.67	Mg I	90	7918.386	Si I	16	7948.12	Sm II	15	7982.09	Nd II
360	7881.79	Al III	130	7920.71	Hf I	5	7948.15	Ru I	135	7982.40	O I
110	7881.90	Y II	5 w	7921.17	Fe III	20000	7948.176	Ar I	100	7982.401	Kr I
50	7881.94	U I	15	7921.69	Te II	300	7948.64	Ce III	12	7982.68	Nd II
16	7882.18	Zr I	35	7921.85	Er I	30	7949.17	Ti I	12	7982.85	Dy II
100	7882.37	Ta I	11	7923.15	Mo I	10	7949.68	Nd II	5	7983.33	Ge I
150	7882.52	Al III	100	7923.16	Pr III	3000	7950.18	Br I	50	7984.51	Hg III
35	7885.31	Nb I	1000	7924.0	S I	30	7950.19	Ta I	11 h	7985.93	Tm I
6 h	7885.70	Tb I	16	7924.43	Ru I	10	7950.34	Te II	15	7986.60	Mo I
80	7886.27	O I	3000	7924.645	Cl I	210	7950.80	O I	190	7986.98	O I
6	7886.284	Th I	200	7924.65	Sb I	5	7952.07	Ta I	135	7987.33	O I
5	7886.48	W I	10	7925.03	Nd II	185	7952.16	O I	9	7987.38	Co I
7	7886.60	Nd II	5 l	7925.26	Rb I	650	7952.52	Cl I	11	7987.97	Th I
300	7887.40	Xe I	4	7925.54	Rb I	8	7952.93	Er I	1200	7988.163	Cu II
300 l	7887.88	Np I	2500	7925.81	Br I	10000	7953.17	Pu I	400	7989.41	Y III
35	7887.99	Eu I	120	7926.20	Ne II	5	7954.594	Th I	30000	7989.94	Br I
1000	7888.12	Pr III	400	7927.118	Ne I	8	7954.76	Nb I	340	7990.53	As II
6cw	7888.56	Pr II	10	7927.30	CeO	13	7955.31	Tb I	60 s	7990.68	Cs I
16	7890.37	Ru I	55	7927.51	Tm I	5	7955.37	K I	500	7991.01	Ce III
300	7890.567	Cu II	10	7927.72	Ce I	5 h	7955.38	Nd II	10000	7991.43	Y III
10	7891.075	Ar I	27	7927.90	Tb II	300	7956.32	F I	60	7993.05	Al I
80	7892.39	Yb III	90	7928.14	Sm II	80	7956.66	Zr I	5	7993.680	Th I
20	7893.10	Yb III	180	7928.597	Kr I	4	7956.83	K I	250	7994.73	Hf I
220	7893.34	Cl I	160	7928.8	S I	3	7957.06	W I	250	7995.07	O I
60	7894.64	Ho I	25	7930.25	Gd II	12	7958.95	Nd I	30	7996.53	Ti I
7	7895.08	Yb I	285	7930.3	S I	80	7959.98	Zr I	2900	7997.85	Cl I
16	7895.96	Sm I	7	7930.81	Mg I	500	7960.31	Ce III	11	7998.03	Tb I
13	7896.37	Mg II	110	7930.84	Tm I	18	7961.08	Pd I	6	7998.75	Ta I
12	7896.40	V	450	7931.7	S I	26 h	7961.58	Ti I	80	7998.939	Fe I
4 h	7896.50	Nd II	9	7931.92	Sm I	5	7962.26	Ge I	10 h	7999.33	Y I
5	7896.737	Pb I	120	7932.349	Si I	600	7962.62	Po I	500	7999.73	Tc I
400	7897.09	Pr III	1500	7933.13	Cu I	20	7963.63	Zr I	12	8000.76	Nd II
600	7897.98	I I	200	7933.22	Kr II	12	7964.51	Er I	4	8001.	Tl III

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
300	8001.0	Se I	7	8041.29	Os I	120	8081.1	Se I	9	8125.12	Sm II
17	8001.04	Tb I	10	8043.24	Nd I	2000	8082.458	Ne I	48	8126.23	Li I
250	8001.14	Pr III	99000	8043.74	I I	10 h	8082.5	Te I	48	8126.45	Li I
19 w	8001.61	Sm II	6	8044.165	Ge I	300	8084.12	Ce III	200	8126.55	Tc I
35 h	8001.89	La I	29	8045.36	Rh I	100	8084.34	Ne II	350	8126.56	F I
15 h	8002.55	Ga I	14 h	8045.71	V	1700	8084.51	Cl I	13	8128.76	Ta I
90	8003.19	Al I	60	8046.047	Fe I	30	8085.06	Tb II	600	8128.911	Ne I
7 h	8003.55	Ti	25	8046.05	Zr I	50	8085.176	Fe I	600	8129.26	F I
1000	8003.63	I I	3	8047.73	Mg I	5	8085.220	Th I	5	8129.407	Th I
160	8005.27	Zr I	40	8048.70	Sm II	2200	8085.56	Cl I	8	8130.0	Tl I
25	8005.4	Ag II	20	8049.00	Rn I	75	8086.05	La I	8	8130.39	Te II
20000	8006.157	Ar I	5	8049.85	Mg I	3000	8086.67	Cl I	10000	8130.86	Pu I
13	8007.27	Co I	12 h	8050.	Bi II	1300	8087.73	Cl I	30000	8131.52	Br I
9	8007.70	Nd I	20 h	8050.78	In I	60	8090.06	Be I	400	8132.23	Pr III
40	8008.	Bi III	400	8051.07	Cl I	1000	8090.76	I I	55	8132.82	Pd I
3	8008.59	Lu III	8	8051.33	Nd II	2000	8092.63	Cu I	60	8132.967	Kr I
13 h	8010.16	Tb II	35hc	8051.39	La I	150	8093.2	Se I	390	8132.99	Zr I
7	8010.58	Hf I	12	8051.89	V	70	8093.241	Si I	70	8133.05	Ca II
21 b	8014.43	LaO	16	8053.06	Zr I	14	8093.48	V I	40	8135.20	Nb I
2	8014.502	Th I	7	8053.308	Ar I	5	8093.626	Th I	2	8135.96	La III
14 h	8014.77	Tm I	60 s	8053.35	Cs I	9	8093.96	Co I	15	8136.20	Rh I
25000	8014.786	Ar I	6	8053.80	Tb I	10	8094.43	Ce I	3000	8136.406	Ne I
65bl	8014.79	LaO	8	8053.93	Ta I	250	8094.67	Cl I	11 h	8136.79	V I
19 w	8014.92	Sm II	7	8054.23	Mg I	150	8094.7	Se I	100	8138.34	Pr III
7	8015.47	Eu I	7	8054.89	W I	5	8095.29	Ge I	11	8138.477	Th I
2200	8015.61	Cl I	20	8055.29	Zr I	1000	8096.75	Ni II	11	8141.10	Pr I
100	8015.724	Cs I	6	8055.43	Pr I	10	8098.72	Mg I	10000	8141.29	Cf I
80	8016.01	F II	22	8055.64	W I	10	8099.17	Nd I	12	8141.75	Nd II
22	8017.19	W I	20	8055.76	Zr I	100	8099.51	Rn I	18	8143.139	Th I
20	8017.50	Ca II	20	8056.02	Yb III	10000 h	8099.84	Pa I	5	8143.19	W I
95	8017.90	Tm I	6	8056.15	Te II	20	8100.	Bi III	12	8143.27	Nd II
30 b	8019.48	LaO	25	8056.52	Hf I	5	8100.11	Ta I	29	8144.59	V I
50	8019.70	Ra II	200	8057.26	Xe I	100	8101.98	Xe I	10	8145.06	Au I
4 h	8020.07	Nd	60	8058.08	Zr I	8	8102.44	V I	18	8146.15	Gd I
20	8020.50	Ca II	200	8058.62	C I	10000	8102.54	Pu I	13	8147.29	Dy I
3 h	8021.33	Tm I	1500	8059.503	Kr I	9 h	8102.86	Si III	180	8149.3	Se I
6	8022.09	Ta I	5	8060.38	W I	3000	8102.90	Pr III	5	8151.64	Hg III
5	8023.03	Er I	120	8060.9	Se I	11 h	8103.45	Si III	150 h	8151.80	Xe II
1100	8023.33	Cl I	150	8061.34	Xe I	20000	8103.693	Ar I	150	8152.0	Se I
5	8024.253	Th II	30 h	8061.4	Te I	4000	8104.364	Kr I	20	8152.58	Zr I
55	8024.84	Ti I	11	8062.64	Th I	50	8105.14	Th III	1000 c	8152.65	Br I
23	8025.12	Sm II	150	8063.09	Zr I	12	8108.59	V I	10000	8153.75	Br I
30	8025.42	Tb II	7	8063.50	Rh I	9 h	8109.07	V I	25000	8154.00	Br I
30	8025.56	Ce II	5	8064.00	Nd II	9	8112.47	Ru I	8	8154.47	Te II
23 w	8026.32	Sm II	16	8065.16	Sm I	6000	8112.899	Kr I	9	8154.55	V I
2000	8026.35	Br I	120	8065.3	Se I	150	8113.528	P III	1	8154.64	Mg I
8	8026.35	Nd	300 d	8065.70	I I	200	8114.09	Sn I	300	8155.11	Np I
75	8026.50	Ta I	70	8065.97	Al I	500	8114.21	Ni II	2 d	8156.91	Pb II
2500	8026.54	Br I	50	8066.99	Cd II	10	8114.28	Zr I	200	8157.7	Se I
29 c	8027.39	V I	19	8067.35	Tb II	3	8114.42	La III	9	8158.54	Ta I
14	8028.13	V I	14	8067.44	Pr I	9	8115.22	Mg II	5 h	8158.99	Be I
5	8029.04	Ta I	30	8068.24	Ti I	35000	8115.311	Ar I	15 b	8159.02	LaO
100	8029.67	Xe I	45	8068.46	Sm II	120cw	8116.80	V I	2	8159.13	Mg I
21	8029.91	Rh I	15	8068.98	Ta I	9 w	8117.16	Sm II	10 h	8159.24	Be I
100 h	8030.5	Sn I	50	8070.	Bi III	10	8117.44	Yb III	300	8159.51	F I
400	8030.80	Ce III	790	8070.08	Zr I	1000	8118.549	Ne I	12	8159.729	Th I
10	8031.039	Ge I	16	8070.71	Ce I	250	8119.54	Pr III	70 c	8161.07	V I
6	8031.92	Pr I	20 h	8074.25	Ga I	20	8120.17	Zr I	26	8161.82	Sm II
16	8032.03	Sm II	110	8075.35	Al I	16	8120.36	Ce I	180	8163.1	Se I
11	8032.433	Th I	900	8075.52	F I	8	8120.43	Mg II	10	8163.125	Th II
14 h	8035.38	V	350	8077.52	F I	10	8120.93	Nd II	5 h	8163.18	Cr I
35	8035.619	Si I	13	8077.59	Gd I	30 h	8121.0	Sn I	27	8164.17	Tb I
12	8035.91	Er I	7	8078.11	K I	700	8121.48	Ni II	7 h	8164.97	Nd I
11 h	8036.09	Rh I	60	8078.92	Cs I	12	8122.07	Nd II	3	8165.72	W I
200	8036.4	Se I	350	8079.033	Cs I	15 b	8122.20	LaO	300 l	8167.42	Np I
15	8039.08	Ta I	10	8079.07	Eu III	10	8122.44	Te II	3 h	8167.5	Ga I
30 h	8039.3	Sn I	6	8079.62	K I	10cw	8122.78	Pr II	10	8168.001	Pb I
10000	8039.34	Pa I	25	8080.32	Hf I	13	8123.82	W I	800 c	8169.38	I I
1000	8040.93	F I	300 h	8080.32	Np I	300 s	8124.59	Np I	7	8169.788	Th I

Intensity	Wavelength	
200	8170.55	Tc I
100	8171.02	Xe I
14	8171.35	V I
8000	8171.41	Y III
5 h	8171.6	Ga I
13	8171.70	Tb I
10 h	8172.21	Ti III
8	8172.56	Nd II
9 h	8173.37	Ti III
6	8173.84	Rn I
16	8173.89	Hf I
300	8174.51	As II
16	8174.66	U I
6	8177.31	Ra I
400	8177.33	Ce III
9 h	8178.00	Ti III
9 c	8178.16	Lu I
600	8179.34	F I
9	8179.83	Nd II
7	8180.21	V I
5 c	8180.74	Ta I
5	8181.34	Pr II
12	8181.85	Er I
9	8182.41	Nd II
10	8182.42	Ti III
150	8182.9	Se I
300 l	8183.06	Np I
5	8183.256	Na I
400	8184.87	N I
100	8185.0	Se I
4	8185.58	Nd II
300	8186.03	Ce III
20	8186.44	Te II
35	8186.71	V I
15	8186.914	Th I
24	8187.33	V I
400	8188.02	N I
300 l	8188.61	Np I
12	8188.77	Zr I
3000	8190.054	Kr I
7 h	8190.43	Si III
6	8190.94	Te II
6 h	8191.16	Si III
300	8191.24	F I
8 h	8191.68	Si III
6	8191.886	Pb I
9 h	8192.68	Ti III
7 h	8193.67	Rh I
14	8194.19	Tm I
2500	8194.42	Cl I
120	8194.6	Se I
40	8194.73	Zr I
9 h	8194.75	Ti III
65	8194.82	Tb II
9	8194.824	Na I
19 w	8195.50	Sm II
300 h	8196.48	C III
11 h	8196.98	Sc I
27	8198.77	Dy II
29	8198.87	V I
10000	8199.04	Pa I
2200	8199.13	Cl I
2200	8200.21	Cl I
5	8200.309	Cd I
250	8200.36	N I
100	8201.57	Dy II
100	8201.72	Ca II
60	8201.73	Zr I
200	8202.72	Kr II
35	8203.07	V I
12	8203.199	Th II
7 h	8203.38	La I
800	8203.78	Cl I
130	8204.58	Hf I
150	8205.27	Tc I
7 h	8205.38	Nd II
6	8206.30	Sm II
700	8206.34	Xe I
100	8206.49	Tc I
350	8208.63	F I
24cw	8209.80	Eu I
10	8209.84	Mg I
5	8210.22	W I
900 h	8210.24	Ba I
300	8210.72	N I
150	8211.31	Tc I
5 c	8211.93	Pr I
18000	8212.04	Cl I
280	8212.53	Zr I
95	8212.57	Tb I
20	8213.03	Mg I
10	8213.99	Mg II
11	8214.33	Tb I
2500	8214.73	F I
570	8216.34	N I
10 l	8217.20	Ca III
5	8217.711	Pb I
11	8218.08	Gd I
80	8218.365	Kr I
11	8218.62	Dy II
26 w	8218.76	Sm II
150	8220.41	Fe I
3000	8220.45	Cl I
20000	8221.74	Cl I
400	8221.82	O I
300	8222.16	Ce III
500 d	8222.57	I I
7	8222.92	Mg II
400	8223.14	N I
10	8224.74	Pt I
5	8225.22	Ge I
7	8226.09	Ge I
15cw	8226.81	Eu I
240 c	8227.0	In II
265	8227.65	O I
265	8230.02	O I
9	8230.33	Sm I
35	8230.642	Si I
3000	8230.77	F I
5 w	8230.88	Fe III
2	8231.408	Th I
10	8231.52	Nd II
10000	8231.635	Xe I
5 w	8231.79	Fe III
500	8232.19	F I
325	8233.00	O I
7	8233.19	Mg II
11	8234.64	Mg II
150 w	8235.33	Pr III
120	8235.35	O I
9 w	8235.45	Fe III
8 w	8236.75	Fe III
500 c	8237.08	Tc I
30 h	8238.66	In I
6 w	8238.98	Fe III
13cw	8240.00	Nb I
4000	8240.05	I I
20	8240.37	Zr I
1 h	8240.61	Si IV
16	8240.98	Sm II
15	8241.13	Sc I
10	8241.55	Ce II
24	8241.61	V I
10000	8241.77	Cf I
400	8242.39	N I
290 h	8243.59	Al III
250 w	8244.89	Pr III
22 h	8245.06	Mo I
5000	8246.86	Br I
50	8247.44	La I
300 l	8247.82	Np I
4	8248.76	Nd II
110	8248.80	Ca II
7	8248.81	Hf I
13 c	8248.95	Ta I
5 h	8249.68	Nd II
9	8250.18	K I
10	8251.5	Te I
8	8251.74	K I
5	8252.395	Th I
250	8252.60	La III
29 c	8253.51	V I
4	8254.07	Be I
15	8254.7	Ag II
70	8254.73	Ca II
8	8255.61	Pb I
29	8255.88	V I
10	8256.013	Ge I
14	8256.67	Ca I
8	8259.08	Tb I
2500	8259.379	Ne I
3	8259.512	Th I
12	8261.09	Ce I
18	8262.06	U I
9 h	8262.57	Si III
4 h	8262.80	Nd II
3000	8263.240	Kr I
9 h	8263.67	Ti III
5	8264.15	Ge I
10000	8264.522	Ar I
100	8264.81	Ne II
20 d	8264.85	Ta I
15000	8264.96	Br I
18	8264.96	Ru I
20	8265.53	Dy I
5 h	8265.64	Si III
2500	8266.077	Ne I
500	8266.52	Xe I
7 h	8266.72	Nd II
800	8267.117	Ne I
15 h	8267.32	Ti III
8	8267.62	Ti
8 h	8269.32	Si III
100	8270.96	Rn I
5 h	8271.38	Si III
40 l	8271.41	Rb I
30	8271.71	Rb I
10000	8271.87	Pa I
6 h	8271.94	Si III
100	8272.353	Kr I
75000 c	8272.44	Br I
40	8272.690	Pb I
4	8272.79	Nd II
500	8273.52	Ag I
15	8273.53	Te II
1500	8274.62	F I
360 h	8275.11	Al III
100	8275.39	La III
10	8275.42	Gd I
18	8275.629	Th I
10	8276.6	Te I
55	8276.95	Hf I
500	8277.560	Cu II
120	8278.07	P I
5	8280.09	Ge I
7000	8280.116	Xe I
5 h	8280.39	V I
6	8281.04	Ge I
1500	8281.050	Kr I
75	8281.62	Ta I
19	8282.37	V I
800	8283.160	Cu II
40	8283.81	Zr I
10 h	8287.07	Be I
300 l	8287.11	Np I
200	8287.75	La III
300 s	8287.75	Np I
19 w	8289.26	Sm II
6	8289.93	Pr I
10	8291.1	Te I
3	8292.529	Th I
5	8294.52	Tm I
5000	8298.107	Kr I
2000	8298.58	F I
6000	8300.326	Ne I
45	8300.83	Pd I
10	8300.88	Sm II
600	8302.40	F I
4 h	8302.74	Nd II
7	8303.31	Mg I
9	8305.60	Mg I
40 w	8305.79	Sm II
140	8305.90	Zr I
13	8305.91	Hf II
300 l	8306.22	Np I
14 h	8306.31	Ti I
9 h	8307.41	Ti I
10	8307.72	Nd II
200	8308.15	Tc I
8	8308.69	Ba III
200	8309.16	Tc I
10000	8309.61	Pu I
10	8310.26	Mg I
9 h	8311.76	Ti I
100 h	8311.86	Ga I
35	8312.82	Er I
8 h	8312.85	Ti I
300 s	8313.66	Np I
8	8314.51	Rn I
450	8314.7	S II
450	8314.7	S I
15 h	8314.92	In I
100	8315.00	Ne II
10	8315.45	Sm I
60	8315.50	Tc I
13 h	8316.04	La I
16	8318.35	U I
15	8320.857	Th I
29cw	8320.93	Nb I
250	8321.11	La III
4	8322.05	W I
20	8324.4	Ag II
8	8324.42	V I
6	8324.50	Nd II
85	8324.69	La I
35	8326.10	Dy I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
10	8326.86	Yb III	100	8372.11	Ne II	19	8416.98	Ti I	2200	8467.34	Cl I
120	8327.053	Fe I	10	8372.12	Te II	40	8417.13	Re I	8 h	8467.62	La I
30	8327.88	Yb III	9	8372.84	Co I	1000	8417.159	Ne I	30	8468.404	Fe I
15	8328.	Bi II	3000	8372.88	Np I	2	8417.54	K I	45	8468.50	Ti I
40 h	8328.44	Mo I	20	8373.6	Tl I	16	8418.23	Ce II	5	8468.84	Mg I
18	8328.57	Er II	4	8375.16	Nd II	4000	8418.427	Ne I	7	8469.8	Te I
9	8329.61	Y I	4	8375.33	Nd II	10 h	8419.91	Ga I	27	8472.01	Tm II
30	8330.451	Th I	99900	8375.94	Cl I	1	8420.00	K I	35	8472.42	Er I
14 h	8331.23	V I	8000	8377.606	Ne I	12	8421.227	Th I	19 w	8473.54	Sm II
20	8331.908	Fe I	100	8377.85	Ti I	300	8422.72	Sn I	11	8473.64	Ru I
4	8332.01	Nd II	15	8379.5	Ag II	200 h	8422.80	Sr I	7	8473.69	Mg I
14	8332.44	Zr I	8 h	8379.80	La I	10000	8423.49	Cf II	10	8474.27	Tl I
150	8332.99	C III	6	8379.84	Pr I	15	8424.41	Ti I	4	8475.14	W I
18000	8333.31	Cl I	5	8380.06	Hf I	20000	8424.648	Ar I	17cw	8475.98	Nb I
10000	8333.85	Cf II	10	8381.05	Rn I	8	8425.59	Rh I	10000	8476.13	Pu I
12	8334.37	Ti I	18	8381.87	U I	120	8426.16	O I	26	8476.48	La I
20000	8334.70	Br I	17	8382.08	Lu I	170	8426.52	Ti I	4000	8477.45	Br I
5	8335.07	Ra I	100	8382.54	Ti I	6 h	8427.82	Pr I	18	8478.360	Th I
520	8335.15	C I	180	8382.67	Cl II	15000	8428.25	Cl I	10	8478.492	Pb I
6	8335.54	Pb II	55	8382.82	Ti I	100	8428.91	As I	10 d	8478.50	Lu I
16	8337.50	U II	3	8382.94	W I	5	8429.42	Ge I	10	8482.21	Ge I
10	8338.04	Ca I	5	8382.98	Hf I	30 w	8432.64	Sm II	10 h	8482.67	Ho I
10	8338.08	W I	19	8383.71	Sm I	300	8433.87	Po I	45 h	8483.39	Mo I
10	8338.54	Ti III	1200	8384.04	Br I	50 c	8434.55	In II	11	8483.56	Ru I
12	8339.12	Ca I	200 h	8386.49	Ga I	490	8434.94	Ti I	800	8484.444	Ne I
1000 l	8339.12	Np I	6	8387.104	Th II	10000	8435.47	Pu I	45 w	8485.99	Sm II
14	8342.03	V I	19	8387.77	Sm II	240	8435.70	Ti I	1000	8486.11	I I
10000	8343.70	Br I	120	8387.770	Fe I	4	8435.77	Ru I	10	8487.48	Rn I
25	8344.25	Hf I	15	8388.	Bi II	24	8438.58	Dy II	30	8489.90	Yb III
24	8344.43	Y I	11	8389.06	Ta I	550	8438.74	N II	8	8492.2	Te I
29	8346.08	Nb I	10 h	8389.30	Ga I	40	8438.93	Ti I	15	8492.5	Ag II
15	8346.12	Mg I	45 h	8389.32	Mo I	17	8439.77	Nb I	10	8494.89	Rn I
12	8346.36	Nd II	120	8389.41	Zr I	150	8440.47	Se I	100 w	8494.99	Pr III
95	8346.53	La I	3	8390.22	K I	3000 h	8441.04	Pa I	5000	8495.360	Ne I
2000	8346.82	Xe I		8391.44	K I	16	8441.21	U I	10000	8495.75	Pu
100	8347.24	Xe II	7	8391.70	Ge I	40	8443.982	Si I	11	8495.82	Ce I
9	8348.28	Cr I	35	8392.01	Dy II	35	8445.39	U I	15	8496.04	Ti I
19 w	8348.68	Sm II	100	8392.02	Cl II	10	8445.47	Gd I	130	8498.02	Ca II
4	8348.81	W I	20	8392.27	Ar I	8	8445.8	Tl II	40	8498.44	Zr I
11	8348.98	Ru I	10000	8392.37	Cm I	810	8446.25	O I	12	8499.52	V I
30	8349.35	Sn I	10000 c	8393.30	I I	1000	8446.36	O I	300	8500.32	C III
10	8349.73	Gd I	12	8394.20	Ti III	21	8446.509	Th I	8	8500.8	Te I
6	8349.74	Rn I	4	8394.71	Nd II	40000	8446.55	Br I	40	8501.547	Si I
10	8350.04	Nb I	10	8395.68	Pb II	935	8446.76	O I	60	8502.221	Si I
10	8352.39	Ca I	5	8396.36	Ge I	25cw	8447.62	Ta I	13	8502.70	Tb I
6	8352.94	Ru I	75	8396.87	Ti I	18	8450.03	U I	250	8503.396	Cu II
14	8353.15	Ti I	11	8398.30	Gd I	40	8450.06	Tb II	11	8503.45	K I
9 h	8353.58	Pd I	20	8400.01	Yb III	6	8450.26	Cr I	10	8505.11	K I
15	8355.8	Te I	7	8400.85	Nd II	17	8450.36	Y I	120	8505.69	Sr II
300	8356.79	Np I	4	8402.60	W I	150	8450.38	Se I	8	8506.70	Ge I
80	8357.04	Sn I	7	8402.81	V I	40	8450.89	Ti I	13 h	8507.37	La I
11	8357.17	Ca I	18	8403.767	Th II	50	8453.17	Zr I	5	8507.66	Ge I
7	8358.72	W I	25	8403.8	Ag II	8 b	8453.55	LaO	29 c	8508.08	Lu I
4	8358.726	Th I	12	8405.85	Dy II	3	8455.24	Cr I	3000	8508.870	Kr I
3000 s	8358.98	Pa I	400	8406.199	Cl I	5 h	8456.87	Nd II	5	8510.621	Th I
1000	8360.71	Cl II	15000	8408.210	Ar I	9 h	8457.10	Ti I	30 w	8510.90	Sm II
2	8361.69	He I	100	8409.10	Pr III	35	8459.19	Lu II	750	8511.061	Cu II
560	8361.84	Cl II	2000	8409.19	Xe I	35	8460.01	Hf I	30 h	8511.80	Tb I
75	8364.24	Ti I	20	8409.384	Pb I	7	8460.79	Tm II	50	8512.94	Ho I
8 h	8365.64	Y I	55	8409.90	Er I	1500	8463.358	Ne I	1500	8513.38	Br I
1500	8365.749	Ne I	60	8411.69	Sb I	5	8464.230	Th I	13 h	8513.57	La I
7	8365.75	Tm I	120	8412.36	Ti I	50	8464.65	Zr I	15	8514.069	Fe I
300 l	8367.11	Np I	100	8412.430	Kr I	10 h	8464.66	Ho I	8 h	8514.65	La II
5	8367.58	Er II	70	8414.00	Zr I	6 h	8464.71	Eu I	50 h	8515.19	Xe II
8	8367.81	Ge I	150	8414.60	I II	8 h	8465.80	Tb II	5	8516.557	Th I
150	8367.84	P I	7 h	8415.51	Ga I	11	8466.18	Er II		8517.37	Li II
3000 s	8369.60	Pa I	5	8415.73	Ta I	2	8466.48	Mg I	14	8517.71	Er II
5 h	8369.67	Rh I	20	8416.64	Dy II	20	8466.87	Ti III	19 h	8518.05	Ti I
50	8370.23	Zr I	15	8416.729	Th I	19 h	8467.15	Ti I	40	8518.32	Ti I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
20	8520.95	Rn I	750	8578.02	Cl I	250	8648.54	Xe I	4000	8698.53	Br I
1000 c	8521.122	Cs I	1	8579.74	Bi I	7	8649.92	Na I	110 h	8699.00	N II
18	8521.37	Er II	5	8582.03	Nd II	6	8650.89	Na I	5	8699.85	Ti III
12	8521.4	Te I	300	8583.45	La III	6	8652.42	Ge I	50	8700.25	In I
15000	8521.442	Ar I	45	8583.45	Tb II	25	8653.	Bi II	9	8700.60	Ge I
17 b	8526.59	LaO	18	8584.21	Zr I	3000 h	8653.51	Pa I	500 c	8700.80	I I
25	8526.99	Nb I	27	8585.11	W I	100	8654.14	As I	12 h	8701.05	Mn I
29cw	8527.73	Re I	450	8585.6	S I	15000	8654.383	Ne I	12	8701.09	Te I
13 h	8527.88	Gd I	75000	8585.97	Cl I	4000	8655.522	Ne I	2	8701.127	Th I
8 h	8528.94	Y I	9 h	8590.94	La I	500	8655.89	N I	11 h	8702.38	Ce II
3000	8529.96	Np I	4000	8591.259	Ne I	27	8655.94	Dy II	500	8703.25	N I
4	8530.53	Nd II	5	8591.53	Nd II	17	8657.68	Dy II	17 h	8703.76	Mn I
100	8531.06	Tc I	12	8591.838	Th I	60	8661.898	Fe I	2000	8704.112	Ne I
100	8531.46	P I	570	8594.00	N I	160	8662.14	Ca II	10 h	8704.85	Ag I
30	8532.	Bi II	10	8594.42	W I	10	8664.1	Tl II	13	8706.32	Sm II
8	8532.17	Pb I	7	8594.87	Nd II	1500 c	8664.95	I I	100 c	8707.21	Tc I
10000 h	8532.66	Pa I	10cw	8595.84	Ta I	10000	8665.02	Pu I	45 w	8708.43	Sm II
18 h	8532.74	Pd I	10000	8597.26	Pu I	10	8665.487	Th I	5	8709.236	Th I
6	8534.49	V I	9 h	8598.18	Ti I	5	8667.07	Nd II	7	8709.90	Pb II
10	8535.68	Te II	16 h	8599.10	Pd I	20	8667.22	B I	10	8710.18	Mg I
40	8536.165	Si I	6	8599.27	Ge I	4500	8667.944	Ar I	160 h	8710.54	N II
12	8539.08	Ce II	100	8600.07	Rn I	4	8668.116	Th I	100	8710.74	Ba II
14	8539.38	Ti I	9 b	8600.81	LaO	100	8668.26	Ne II	18	8710.76	U I
5	8539.795	Th I	18	8601.84	Ho II	70	8668.57	B I	22	8710.84	Ru I
170	8542.09	Ca II	5000 w	8602.74	Pr III	21	8668.63	Gd I	40	8711.24	Hf I
23	8543.22	Sm II	30	8603.40	Tb I	5	8669.60	Ge I	570	8711.70	N I
17 c	8543.46	La I	2000	8603.96	Rb II	40	8670.19	Ho I	12	8712.69	Mg I
100	8543.61	Tc I	50 h	8604.23	Xe II	10 h	8670.92	Mn I	6	8712.82	Nd II
2	8544.54	Bi I	10	8604.63	Te II	15	8671.	Bi III	5	8712.90	Ge I
600	8544.696	Ne I	6 h	8605.27	Pr II	12 h	8672.06	Mn I	10	8714.59	Pr II
7 c	8544.95	Pb II	7	8605.776	Ar I	19hw	8672.11	La I	6	8715.03	Nd I
65	8545.44	La I	75	8607.95	U I	15	8672.95	Te II	11 h	8715.95	Dy II
20	8545.61	Ho II	200	8609.134	Cu II	10 h	8673.97	Mn I	50 h	8716.19	Xe II
7 h	8546.07	Tm II	35 c	8610.98	Lu I	40	8674.43	La I	13	8717.83	Mg I
150	8546.48	Hf I	10	8612.64	Ce I	90	8675.39	Ti I	30 w	8717.89	Sm II
13 c	8547.25	Nb I	8	8613.27	W I	15	8675.83	Rn I	500	8718.83	N I
30	8547.36	Be I	100	8613.85	P I	220	8676.08	N II	5	8719.39	Pb II
60	8547.67	Be I	3	8614.50	W I	5	8677.48	Nd	30	8719.56	Sr II
40	8548.12	Ti I	23 w	8617.03	Sm II	12 w	8677.81	Sm II	13 h	8720.41	La I
6	8548.86	Cr I	500	8618.26	Po I	9	8678.25	Tb I	5	8722.810	Pb I
2200	8550.44	Cl I	100	8619.55	Sb I	17	8678.49	Dy II	14	8724.98	Ru I
11 h	8550.49	Ta I	3	8621.325	Th I	30	8678.95	In I	7	8727.77	Eu I
400	8552.60	Sn I	8	8621.68	Te II	5000	8679.492	Ne I	40	8728.011	Si I
6	8554.946	Th I	7 h	8624.22	La I	700	8680.28	N I	250	8728.89	N I
120	8556.780	Si I	6bl	8624.86	VO	285	8680.5	S I	3000	8729.82	Pu I
1000	8557.73	Br I	450	8628.54	Cl I	50 h	8681.7	Sn I	8	8732.401	Th II
1800 h	8559.97	Ba I	650	8629.24	N I	5000	8681.921	Ne I	10	8733.81	Te II
17 c	8560.54	Nb I	11	8630.12	Dy I	20	8682.63	In I	19	8734.69	Ti I
5	8563.49	Fe III	7 h	8632.1	Te I	30 h	8682.7	Sb I	6	8734.78	Ge I
15 b	8563.54	LaO	23 w	8632.82	Sm II	45	8682.99	Ti I	10	8734.86	Zr I
100	8564.71	As I	8	8632.9	Tl II	650	8683.40	N I	10	8734.99	Mg II
8	8564.89	Ge I	10	8633.95	Ca I	500	8686.15	N I	10000	8735.27	Pa I
11	8565.73	Tm II	6000	8634.647	Ne I	3500	8686.26	Cl I	17	8736.02	Mg I
1000	8566.28	Br I	150	8637.62	P I	110	8687.43	N II	100	8737.71	Ba II
200 w	8567.63	Pr III	3	8638.363	Th I	150	8688.621	Fe I	100 c	8737.93	Tc I
500	8567.74	N I	15	8638.47	La I	200	8688.91	Sr II	300	8739.39	Xe I
10000	8568.83	Cf II	20000	8638.66	Br I	23	8691.28	U I	30 h	8740.93	Mn I
9	8569.77	Ti I	10	8639.76	Rn I	6	8691.29	Nd II	21	8740.96	Nb I
16	8570.52	U I	3000 h	8639.91	Pa I	500	8691.58	Pr III	250	8741.54	P I
1000	8571.352	Ne I	160	8640.06	Hf I	10000	8691.94	Pu I	150	8742.33	Se I
150	8572.64	Sb I	290	8640.70	Al II	100	8692.20	Xe I	75	8742.451	Si I
10000 s	8572.96	Pa I	300	8641.71	Cl I	23	8692.33	Ti I	11	8745.66	Mg II
11	8573.122	Th I	21cw	8642.67	Eu I	450	8694.7	S I	200	8747.36	N I
20000	8575.24	Cl I	8 c	8643.43	Nd II	6	8695.07	Nd II	12	8747.6	Ag II
4	8575.35	Co I	4000	8645.09	Y III	1000 s	8696.23	Np I	18	8748.033	Th I
12	8575.78	Te II	30 h	8645.70	Ag I	11	8696.83	Dy II	250 d	8748.22	I I
17	8575.87	Nb I	3000	8647.041	Ne I	200	8696.86	Xe I	35	8748.38	La I
15	8575.92	Ta I	10 h	8647.66	Ce I	8 h	8697.32	Ho	12	8749.48	Zr I
200	8576.01	Xe I	50	8648.462	Si I	21 c	8697.55	Nb I	20	8750.40	Dy II

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
100	8752.009	Si I	15000	8819.96	Br I	6	8897.92	Te II	1000 l	9006.31	Np I
18	8753.69	U I	325	8820.43	O I	1000 d	8898.50	I I	10000 l	9016.18	Np I
2	8754.88	Bi I	135	8821.73	As I	60	8899.52	Zr I	3	9017.10	Ti III
30	8757.76	U I	15 h	8823.8	Sc I	1000	8900.92	F I	1 h	9018.16	Si IV
205	8758.18	Te I	12	8824.23	Fe I	13	8902.19	K I	30 h	9018.95	Sn I
100	8758.20	Xe I	10	8824.32	Mg II	12	8904.02	K I	300	9021.77	Rb II
15	8758.244	Th I	25000	8825.22	Br I	35	8905.78	Nb I	5000	9022.40	I I
30 w	8758.28	Sm II	35	8825.82	La I	1000 s	8906.02	Np I	350	9024.42	Br II
65	8761.35	Pd I	110	8828.91	Al I	2	8907.038	Th I	350	9025.49	F I
19 h	8761.40	Sc I	50	8829.78	Sc III	2	8907.81	Bi I	5	9031.819	Th I
200 c	8761.415	Cs I	200 c	8829.82	Tc I	100	8908.70	Pr III	160	9035.9	S I
3	8761.54	Bi I	500	8830.907	Ne I	200	8908.73	Xe I	3	9038.4	Tl I
4	8763.96	K I	12	8831.52	Te I	15	8909.18	Ca I	200	9038.61	Se I
150	8764.110	Kr I	21 h	8832.06	Gd II	100	8912.07	Ca II	2000	9038.982	Cl I
65	8765.74	Tb II	80 c	8832.6	In II	300	8912.78	F I	400	9042.10	F I
23	8766.64	Ti I	13	8833.08	Dy II	90	8912.90	Al I	18	9043.39	Te I
3	8767.05	K I	30 h	8834.35	Sc I	2200	8912.92	Cl I	2500	9045.43	Cl I
21	8767.97	Nb I	20 c	8834.49	Ho I	95	8913.66	Sm II	400	9045.45	Xe I
22	8768.64	Er I	11	8835.08	Mg II	450	8914.99	Ba I	25	9048.252	Th I
11	8770.36	Gd I	19 h	8835.85	Y II	90	8915.98	Ho II	10	9050.82	Pb II
500	8771.38	Pr III	70	8836.09	Zr I	300	8918.86	Se I	300	9056.53	Ce III
4000	8771.656	Ne I	3000	8836.16	Pu I	3000	8919.501	Ne I	160 d	9057.01	O I
20	8771.860	Ar II	17	8839.10	Nd II	60 c	8919.85	V I	15000	9058.33	I I
25	8772.14	Ce II	21	8839.63	La I	70 h	8922.56	Yb II	250	9061.43	C I
360	8772.87	Al I	5	8841.185	Th I	5	8923.31	K I	200	9062.47	C I
450	8773.90	Al I	180	8841.28	Al I	140	8923.56	Al I	2	9063.27	He I
11 h	8774.8	Sc	18	8842.073	Th II	20	8923.57	Mg I	10	9063.43	Pb II
8	8775.573	Th I	12	8842.61	Ca I	4	8925.44	K I	5	9063.953	Th I
11 h	8776.63	Er II	14 h	8849.14	Gd I	110	8927.36	Ca II	5	9068.785	Ge I
6000	8776.748	Kr I	180	8849.91	Ar I	2000	8928.692	Kr I	1000	9069.656	Cl I
9	8777.36	Ru I	24	8850.37	Dy II	200	8930.83	Xe I	2000	9073.17	Cl I
15 h	8778.71	Ti I	4	8850.4	Tl I	6000	8932.40	Br I	20	9075.394	Ar I
16 w	8780.59	Sm II	18	8851.15	Te I	29 c	8932.93	V I	200	9078.28	C I
12000	8780.621	Ne I	1000	8853.24	I I	20	8934.	Bi III	100	9079.46	Ne II
12	8780.83	Dy I	2000	8853.80	I I	1000	8942.70	Np I	300	9079.58	Ce III
6	8782.46	Eu I	7000	8853.867	Ne I	600 c	8943.46	Cs I	80	9083.14	Se I
10000	8783.753	Ne I	1000	8854.05	Pr III	30 h	8944.33	Ga I	250	9088.51	C I
13	8784.85	Gd I	20 h	8856.37	Ga I	40	8947.15	Cr I	120	9088.79	Se I
10	8786.23	Zr I	10	8857.457	Pb I	3000	8948.06	Cl I	60	9089.91	Al I
23 w	8788.83	Sm II	3000	8857.50	I I	1800	8949.39	Br I	10	9093.67	U I
6	8789.88	Ge I	26	8859.76	Sm II	16	8951.96	U I	450	9094.83	C I
35	8790.389	Si I	300	8860.98	Ba I	1000	8952.25	Xe I	6	9094.831	Th I
12cw	8790.88	Eu I	300	8862.32	Xe I	5	8955.848	Th I	5	9095.957	Ge I
45	8791.39	Dy II	9	8862.55	Ni I	2 h	8957.25	Si IV	1000	9098.86	I I
4	8792.058	Th I	25	8863.	Bi II	15	8957.97	Th II	16	9099.10	Ca I
12	8793.38	Fe I	1000	8865.306	Ne I	9000	8964.00	Br I	250	9099.98	Pr III
10000 c	8793.47	Br I	13	8865.53	W I	400	8964.69	I I	13	9105.62	Ca I
15 h	8794.72	Sc I	1000	8865.755	Ne I	12	8967.47	Ca I	3	9107.225	Th I
10	8795.76	Gd I	30	8865.89	Sc III	40	8967.641	Th I	12	9108.82	Ca I
10000	8796.21	Y III	9	8866.84	Er II	100	8969.69	Se I	300	9111.80	C I
300 h	8799.76	Ba I	20	8866.96	Fe I	12	8971.62	V I	12000	9113.91	I I
95	8800.62	Y I	18 h	8867.31	Gd I	5	8976.75	Tl I	8000	9116.59	Y III
300	8801.37	Be I	40 l	8868.512	Rb I	19	8976.83	Cr I	2	9118.140	Th I
3	8804.590	Th I	15	8868.834	Th I	300	8978.88	Rb II	120	9118.29	O I
16	8804.98	Zr I	30	8868.852	Rb I	100	8981.05	Xe I	7500	9121.15	Cl I
16 h	8805.48	Ho II	100	8869.66	As I	3	8987.408	Th I	35000	9122.967	Ar I
14	8806.76	Mg I	18	8870.30	Eu I	200	8987.57	Xe I	600	9128.03	I I
900	8807.58	F I	50	8872.17	P I	2000	8988.57	Ne I	20	9130.	Tl II
10	8807.75	Rn I	360	8874.5	S I	7	8989.03	Mg I	20	9130.5	Tl I
20 h	8808.75	Ga I	4	8875.233	Th I	16	8989.92	U I	250	9131.90	Pr III
2	8809.42	Ni I	15	8881.58	Sc III	9	8991.69	Mg I	30	9132.21	Sb I
12	8810.84	Ce I	6	8882.18	Be I	400	8993.13	I I	80	9134.71	O I
100 w	8813.5	In II	110	8882.5	S I	10	8997.16	Mg I	10	9139.56	U I
30 h	8813.56	Ga I	220	8884.2	S I	15	8999.56	Fe I	70	9139.95	Al I
35	8814.29	Sc III	125	8886.17	Pr III	15	9000.9	Ag II	80	9140.83	Se I
29cw	8815.56	Nb I	4000	8888.98	Br I	200	9001.97	Se I	3000 l	9141.30	Np I
19	8818.93	La I	30	8891.20	Ce II	81	9004.37	Te I	6000	9148.67	Ne I
3	8819.15	Co I	40	8894.47	In I	65	9004.73	Hf I	80	9150.14	O I
5000	8819.41	Xe I	30000	8897.62	Br I	1000 s	9004.75	Np I	80	9151.48	O I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
4	9153.88	Na I	40000	9265.42	Br I	175	9388.56	Pr III	25	9505.30	F I
235	9156.01	O I	250 w	9265.56	Pr III	300	9391.36	Rb II	10	9505.392	Th I
500	9162.65	Xe I	490	9265.94	O I	40	9392.74	Be I	235	9505.59	O I
30000	9166.06	Br I	640	9266.01	O I	570	9392.79	N I	40	9509.4	Tl I
100	9167.52	Xe I	10	9266.208	Th I	1500	9393.862	Cl I	200	9513.38	Xe I
40	9170.00	Sr I	135	9267.28	As I	6	9398.868	Ge I	4	9516.60	He I
10	9170.08	In I	60	9271.12	Se I	15	9399.085	Th I	400	9518.68	Sb I
3	9170.825	Th I	1000	9275.52	Ne I	185	9399.19	O I	8	9521.76	Ba III
10	9171.14	Ca I	10	9276.276	Th I	200 h	9402.82	Kr II	210	9521.96	O I
350	9172.322	Cs I	10	9276.44	U I	800	9405.73	C I	30 l	9522.65	Rb I
15000	9173.63	Br I	20	9283.90	Sr I	50 h	9410.86	Sn I	5	9523.05	Rb I
20000	9178.16	Br I	200	9287.56	Ne II	40 h	9411.25	Sr I	120	9523.36	O I
350	9178.68	F I	4000	9288.86	Cl I	100	9412.72	Si II	120	9523.96	O I
60	9181.88	Se I	10	9289.563	Th I	285	9413.5	S I	30	9525.78	P I
2 h	9183.1	Tl I	150	9290.65	Al II	100	9413.506	Si I	3	9526.17	He I
120	9184.38	La III	110	9290.75	Al II	25	9414.96	Mg I	100	9528.28	O I
40	9190.45	Be I	400	9291.531	Ar I	80 h	9415.37	Sn I	1	9529.27	He I
3000	9191.731	Cl I	20	9292	Cd I	25	9416.97	Ca I	3000	9533.07	Pu I
550	9194.638	Ar I	10000	9293.25	Cm I	285	9421.9	S I	5000	9534.16	Ne I
30	9195.30	I II	8	9293.476	Pb I	5000	9425.38	Ne I	10	9534.88	Ca I
12	9196.80	Te I	500 h	9293.82	Kr II	4000	9426.71	I I	20 l	9540.18	Rb I
500	9197.596	Cl I	100	9294.10	Sr I	3000	9427.15	I I	5	9545.97	H I
120 c	9197.7	In II	200	9300.61	As I	20	9427.99	In I	3000	9547.40	Ne I
10	9201.51	U I	6000	9300.85	Ne I	10000 s	9429.13	Bk I	11	9548.38	Ca I
6000	9201.76	Ne I	15	9306.60	Sr I	17	9429.81	Mg I	175	9549.77	Pr III
120 c	9202.0	In II	300	9308.08	Ba I	10	9431.603	Th I	10	9561.24	Th I
10	9203.963	Th I	1500	9310.58	Ne I	100	9432.50	Se I	10000	9567.08	Cm I
30	9204.50	Sr I	90	9312.00	Ca II	19	9432.76	Mg I	300	9567.37	Ce III
15	9206.78	Te I	3000	9313.97	Ne I	200	9433.67	F I	100	9567.97	Ca II
17	9207.64	Te I	4	9317.722	Th I	300	9434.04	Br II	290	9571.52	Al III
100	9208.538	Cs I	30	9319.20	Sr I	285	9437.1	S I	120	9577.01	Ne II
2	9210.34	He I	10000 s	9319.30	Bk I	15	9438.05	Pb I	500	9577.52	Kr II
100	9212.63	La III	100	9319.56	Ca II	20	9438.78	Mg I	100	9579.74	Pr III
450	9212.9	S I	125	9320.54	Pr III	400 h	9448.95	Sr I		9581.42	Li II
220 w	9213.0	In II	110	9320.65	Ca II	3500	9452.10	Cl I	1000	9584.801	Cl I
110	9213.90	Ca II	15000	9320.86	Br I	300	9455.92	Ba I	300 h	9589.36	Ga I
14	9218.25	Mg II	200 h	9320.99	Kr II	10	9456.80	Ca I	450	9589.37	Ba I
300	9219.69	Ba I	300 h	9324.58	Ba I	3000	9459.21	Ne I	50 h	9591.35	Xe II
4000	9220.06	Ne I	6000	9326.51	Ne I	250	9460.68	N I	3500	9592.22	Cl I
2000	9221.58	Ne I	50	9327.02	Rn I	15	9461.030	Th I	25	9593.54	P I
200	9222.32	Pr III	10	9327.54	Mg II	10	9463.61	He I	20 h	9594.25	Ga I
15000	9224.499	Ar I	400	9328.20	Ce III	6	9465.94	Na I	15	9595.70	K I
3	9224.64	Rb I	250	9334.33	Pr III	3000 l	9468.66	Np I	600	9596.00	Sr I
4	9225.	Tl II	1000	9335.05	I I	12	9469.00	Te I	14	9597.83	K I
2000	9226.69	Ne I	10000	9337.70	Cf	200 h	9470.93	Kr II	230	9597.95	As I
600	9227.74	I I	300	9338.87	Rb II	15	9474.882	Th I	2000	9598.22	I I
250	9227.87	Po	10	9340.54	Mg II	20	9474.993	Ge II	110	9599.24	Ca II
450	9228.1	S I	7	9340.706	Th I	20	9475.645	Ge II	80	9601.82	Ca II
10000 l	9228.52	Cf	1 h	9343.89	Be II	2	9476.43	Be II	150	9603.03	C I
2	9234.25	Rb I	7	9347.24	K I	16	9477.03	Be II	1	9603.42	He I
450	9237.5	S I	3	9349.25	K I	1000	9479.32	Rb II	10	9604.28	Ca I
500	9238.48	Kr II	40 h	9349.83	In I	10 c	9480.33	I II	15	9604.297	Pb I
160 d	9241.1	In II	6	9351.59	K I	120	9481.16	O I	500 h	9605.80	Kr II
20 h	9243.92	Be I	1600	9354.220	Ar I	120 d	9482.88	O I	360	9605.99	Al III
13	9244.27	Mg II	300	9361.95	Kr II	5000	9486.68	Ne I	6	9608.73	Pb I
2 d	9245.28	Pb II	100	9362.082	Kr I	500	9486.964	Cl I	900	9608.88	Ba I
500 c	9246.41	Rb II	300	9367.03	Ce III	235	9487.43	O I	300	9612.99	Rb II
12	9246.50	Mg I	1500	9370.06	Ba I	4	9492.559	Ge I	8	9613.689	Th II
2 h	9252.6	Tl I	60 h	9370.27	In I	140	9492.71	O I	150	9616.40	Sn I
3	9254.	Tl II	2000	9373.31	Ne I	200 h	9492.92	Ga I	400 h	9619.61	Kr II
10	9254.28	Au I	200 w	9373.50	Rb II	200 h	9493.12	Ga I	250	9620.80	C I
30	9255.78	Mg I	100	9374.76	Xe I	700 l	9493.72	Rb II	100	9622.13	O I
450	9260.81	O I	175	9377.44	Pr III	15	9495.501	Th I	300	9624.70	Sr I
490	9260.84	O I	3000 s	9379.33	Np I	15	9497.191	Th I	120	9625.29	O I
450	9260.94	O I	60	9380.45	Sr I	265	9497.97	O I	7	9625.664	Ge I
400	9262.58	O I	5	9384.35	Pb I	160	9499.30	O I	290	9626.70	As I
540	9262.67	O I	5	9385.89	Pb I	8	9502.45	Mg I	12	9631.89	Mg II
590	9262.77	O I	10	9385.90	U I	7	9503.11	Mg I	11	9632.43	Mg II
10	9265.34	U I	500	9386.80	N I	5	9503.43	Mg I	250	9632.509	Cl I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
12	9632.647	Th I	500	9813.213	Cu II	689	9956.30	Te I	400	10123.602	Cs I
100	9638.10	Sr I	10	9819.00	U I	285	9958.9	S I	10000	10126.20	Bk I
300 h	9645.72	Ba I	10	9819.05	U I	37	9959.93	Te I	110 h	10126.27	N II
100 h	9647.70	Sr II	15	9822.11	F I	500	9960.354	Cu II	750	10131.16	I I
10000	9649.51	Cf	60	9825.58	Se I	7	9961.28	Na I	15	10133.56	Th II
2000	9649.61	I I	10	9826.45	Th I	160 h	9961.86	N II	1	10138.50	He I
650	9649.9	S I	40	9827.78	Bi I	10	9964.11	U I	15	10138.8	Bi I
3000 d	9653.06	I I	250	9827.978	Cu II	220 h	9969.34	N II	2000	10139.75	Hg I
10	9653.26	U I	1500 h	9830.37	Ba I	325	9977.13	Te I	3000	10140.08	Br I
2000 d	9657.04	Bi I	200	9830.798	Cu II	100	9977.86	In I	296	10151.06	Te I
10000	9657.12	Cm I	20	9833.42	Th I	136	9979.31	Te I	50	10157.91	U I
25000	9657.786	Ar I	230	9833.76	As I	15	9983.20	Mg I	500	10160.33	Pr III
300	9658.44	C I		9839.25	Th IV	45	9985.85	Te I	10000 l	10186.58	Bk I
12	9662.04	F I	109	9842.30	Te I	17	9986.47	Mg I	4	10200.952	Ge I
200	9663.34	Kr II	20	9847.32	Be I	500 w	9991.16	Pr III	15	10216.32	Fe I
12	9663.65	Ca I	500	9850.52	Sn I	18	9993.21	Mg I	200	10217.25	Se I
10	9664.41	Ca I	80	9854.74	Ca II	160	9995.31	O I	1000	10221.46	Kr II
10	9664.700	Th I	500	9856.314	Kr I	900	10001.08	Ba I	100	10223.04	Ca II
1000	9665.42	Ne I	600	9861.280	Cu II	500	10003.05	I I	1200 h	10233.23	Ba I
300	9671.54	Rb II	10000 l	9862.39	Bk II	450	10006.588	Cu II	6000	10237.74	Br I
450	9672.3	S I	200	9863.33	N I	100	10010.63	As I	500	10238.63	Pr III
15	9674.351	Pb I	10	9863.4	Tl I	30	10011.9	Tl I	1000	10238.82	I I
4	9676.106	Th I	600	9864.137	Cu II	550	10022.969	Cu II	200	10257.03	In I
14	9676.30	Ca I	160 h	9865.41	N II	285 h	10023.27	N II	50	10259.55	U I
160	9677.38	O I	30	9866.78	Sb I	290	10024.04	As I	300	10261.01	Sb I
3000 s	9679.13	Np I	110 h	9868.21	N II	350	10024.359	Cs I	140	10284.79	La III
450	9680.8	S I	10	9868.36	U I	6	10027.73	He I	15	10285.45	F I
150	9685.32	Xe I	532	9868.92	Te I	500	10031.10	Pr III	200	10290.458	Pb I
14	9688.67	Ca I	400	9875.970	Cl I	2	10031.16	He I	10000	10292.44	Bk I
2000 c	9689.05	Rb II	10000 l	9879.29	Bk I	600	10032.10	Ba I	800	10295.42	Ne I
450	9693.7	S I	200	9883.969	Cu II	220 h	10035.45	N II	1000	10299.62	Br I
80	9694.66	O I	100	9886.05	As I	300	10036.66	Sr II	397	10300.56	Te I
65	9694.91	O I	160 h	9887.39	N II	550	10038.093	Cu II	20	10300.6	Bi I
285	9697.3	S I	110	9890.63	Ca II	15	10039.364	Th I	500	10301.58	Pr III
50 l	9698.68	Xe II	220 h	9891.09	N II	5	10039.436	Ge I	377	10307.45	Se I
15	9700.564	Th I	10000 l	9892.38	Bk I	3000	10046.75	Pu I	10000 s	10308.41	Cf
13	9701.94	Ca I	10 h	9895.63	Be I	80 h	10047.98	F II	10000	10310.83	Cm I
1000	9702.439	Cl I	20 h	9895.96	Be I	7	10049.4	H I	10	10311.23	He I
3	9702.60	He I	10000	9896.40	Br I	5950	10051.41	Te I	2	10311.54	He I
200 h	9711.60	Kr II	140	9900.55	As I	180	10052.06	Ar I	205	10323.05	Te I
100	9718.16	Xe I	500 w	9900.92	Ni II	650	10054.938	Cu II	500	10324.59	Pr III
5660	9722.74	Te I	118	9902.61	Te I	220 h	10065.15	N II	900	10327.26	Se I
5000	9731.73	I I	12	9902.65	F I	160 h	10070.12	N II	1000	10327.31	Sr II
25	9734.34	F I	120	9909.05	O I	35 l	10075.282	Rb I	80	10331.03	Be I
20	9734.74	P I	170	9915.71	As I	30 l	10075.708	Rb I	30	10332.72	Ar I
285	9739.7	S I	550	9916.419	Cu II	150	10076.29	Al II	20	10343.81	Ca I
50	9741.1	Sn I	500	9917.954	Cu II	200	10078.49	Sb I	10000	10351.73	Cm I
235	9741.50	O I	290	9923.05	As I	450	10080.354	Cu II	50	10364.33	Sb I
110	9741.9	S I	3000	9923.19	Xe I	25	10084.22	P I	20	10370.34	La III
100 h	9742.8	Sn I	80	9923.99	La III	15	10089.138	Th I	30	10371.269	Si I
250	9744.426	Cl I	550	9925.594	Cu II	4097	10091.01	Te I	400	10375.20	I I
15	9746.46	Th I	20	9930.4	Tl I	10000 l	10091.99	Np I	1500	10377.65	Br I
25	9750.73	P I	3000 l	9930.55	Np I	14	10092.16	Mg II	10	10382.427	Ge I
2000	9751.758	Kr I	90	9931.39	Ca II	16	10095.52	Be II	640	10386.36	Se I
235	9760.65	O I	5	9932.21	Ra I	20	10095.73	Be II	400	10391.74	I I
200	9776.06	Rb II	285	9932.3	S I	104	10099.57	Te I	5	10391.76	Mg II
4500	9784.503	Ar I	10	9932.76	U I	20	10104.5	Bi I	6	10392.23	Mg II
185	9785.54	Te I	200	9934.76	Rb II	250	10105.13	N I	331	10392.549	Cl I
6000	9793.48	Br I	140	9936.98	O I	279	10106.05	Te I	10	10404.913	Ge I
50	9796.79	P I	2	9937.4	Tl I	5	10106.13	Rn I	6	10405.49	I II
2000	9799.70	Xe I	450	9938.998	Cu II	300	10108.89	N I	15	10419.57	Th II
10000 l	9801.18	Bk I	80	9939.78	Be I	200	10110.60	Yb III	120 d	10421.18	O I
150	9802.98	Pr III	120	9940.41	O I	350	10112.48	N I	10000	10424.49	Cm I
500	9803.14	Kr II	6	9948.57	Rn I	400	10114.64	N I	38	10432.83	Cl II
300 h	9805.38	Sn I	400	9949.14	Sb I	381	10118.08	Te I	5	10434.32	Pb I
175	9806.37	Pr III	6	9949.67	K I	60	10119.92	Be II	100	10453.09	As I
200	9807.057	Cl I	285	9949.8	S I		10120.	Li II	285	10455.5	S I
100	9808.86	Ne II	15	9953.20	Mg I	100	10123.414	Cs I	25	10456.47	Sn I
10	9812.70	Th I	5	9954.14	K I	15	10123.6	He II	70	10456.8	S I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
30000	10457.96	Br I	3000	10755.92	Br I	80	10979.308	Si I	240	11303.04	Ba I
400	10458.37	Ce III	30	10759.16	Ar I	30	10982.061	Si I	33	11318.13	Ge I
285	10459.5	S I	5	10759.41	Pb I	10	10984.00	Sr I	3	11333.08	Pb I
5000	10466.54	I I	7	10759.74	Pb I	298	11007.80	Te I	20	11334.72	In I
100	10467.177	Ar II	110	10768.36	Al I	180 h	11012.69	Ba I	17	11336.97	Sn I
13	10469.65	Fe I	140	10782.04	Al I	300	11012.79	Sb I	20	11354.719	Th I
1600	10470.054	Ar I	30	10784.550	Si I	80	11017.965	Si I	265	11358.69	O I
300	10471.26	Ba I	80	10786.856	Si I	17	11019.87	K I	14	11374.08	Fe I
13	10478.034	Ar I	120 h	10791.25	Ba I	16	11022.67	K I	11	11381.45	Na I
9	10479.63	K I	10000	10792.25	Cm I	15	11032.10	Mg I	100	11384.13	U I
5	10482.15	K I	80	10794.11	Sb I	14	11033.66	Mg I	1600	11390.434	Ne I
8	10487.11	K I	1500	10798.07	Ne I	15	11051.90	Th I	231	11392.62	Cl I
50 h	10488.3	Sb I	50	10799.78	U I	100	11054.25	Zn I	12	11403.78	Na I
40	10488.80	Tl I	9	10801.47	Cl II	6	11059.22	Pb I	1100	11409.134	Ne I
745	10493.57	Te I	11	10807.58	Sn I	30	11066.46	Be I	269	11409.69	Cl I
400	10494.42	Ce III	35	10811.08	Mg I	50	11072.44	Bi I	25	11410.43	U I
100	10498.965	Pb I	7	10812.896	Ar II	11	11078.869	Ar I	52	11422.32	Fe I
180	10506.50	Ar I	10000 s	10817.45	Np I	40 h	11079.95	Sb I	1000	11436.33	Cl I
10	10506.62	Cl II	25	10823.93	U I	1	11084.68	I II	87	11439.12	Fe I
10000	10508.11	Cm I	140	10827.091	Si I	30 h	11084.98	Sb I	12	11441.832	Ar I
14	10509.12	Cl II	300	10829.09	He I	10200	11089.56	Te I	200	11454.59	Sn I
197	10509.86	Te I	1000	10830.25	He I	25	11095.77	U I	500	11457.481	Kr I
19	10512.46	Cl II	2000	10830.34	He I	5	11101.61	Tl I	55	11459.05	Ge I
25	10514.17	Cl II	100	10830.36	Yb III	20	11103.51	Ga I	2 d	11479.49	Pb II
10000 l	10527.71	Bk I	8	10834.87	Na I	50 h	11104.84	Sb I	4	11483.7	Tl I
6	10529.45	P I	100	10838.37	Xe I	30	11106.46	Ar I	150	11483.77	Ge I
300	10534.36	Ce III	13	10838.97	Ca I	50 h	11108.52	Sb I	6620	11487.23	Te I
20	10536.19	Bi I	600	10839.73	Sb I	150 h	11114.42	Ba I	400	11488.109	Ar I
250	10539.57	N I	60	10843.854	Si I	3000	11114.82	Pu I	2	11488.76	Pb I
10000	10542.98	Cm I	2000	10844.48	Ne I	21	11119.80	Fe I	120	11496.39	Be I
100	10554.93	U I	13	10861.58	Ca I	300	11123.05	Cl I	10000 l	11500.30	Bk I
15	10556.45	Th I	20	10862.31	F I	10	11125.130	Ge I	50	11503.38	U I
2000	10562.41	Ne I	13	10863.87	Ca I	3000	11143.020	Ne I	10000	11507.45	Cm I
10000 l	10568.83	Cf	200	10868.58	Sb I	508	11163.74	Te I	1000	11512.82	Tl I
10000 l	10570.53	Bk I	30	10868.79	Si I	75	11167.84	U I	3000	11522.746	Ne I
3	10572.28	Na I	14	10869.50	Ca I		11173.	Be II	1500	11525.020	Ne I
100	10575.02	As I	130	10869.541	Si I	1	11173.73	Be II	950	11536.344	Ne I
8	10581.52	P I	7	10872.70	Sr II	3500	11177.528	Ne I	15	11551.6	Bi I
120	10585.141	Si I	110	10872.98	Al I	100	11187.108	Kr I	350	11558.46	I I
200	10585.60	Sb I		10875.05	Th IV	13	11187.60	Si I	25	11568.81	U I
3000	10594.38	Pa	400	10879.55	Sb I	30	11189.61	Sb I	10000 s	11575.34	Bk I
120	10603.431	Si I	14	10879.87	Ca I	70	11191.85	Sn I	5	11592.9	Tl I
170	10614.07	As I	30	10882.802	Si I	13	11224.57	Sr II	91	11593.59	Fe I
10000 s	10614.84	Cf	30	10885.336	Si I	30	11230.259	Th I	500	11601.537	Ne I
50	10649.249	Pb I	5	10885.42	Cl II	400	11236.56	I I	255	11607.57	Fe I
124	10650.30	Se I	15	10886.688	Pb I	700	11241.25	Sr I	12	11611.09	Si I
120	10660.975	Si I	230	10891.73	Al I	230	11252.83	Ge I	1200	11614.081	Ne I
3	10667.65	He I	54	10894.00	Sn I	450	11253.19	Al I	175	11614.81	Ge I
200	10673.565	Ar I	10000	10897.45	Cm I	570	11254.88	Al I	200	11616.26	Sn I
1000	10677.41	Sb I	60 h	10898.10	Ga I	5	11255.93	Mg II	12	11619.29	C I
11	10681.773	Ar I	100 h	10905.95	Ga I	4	11256.35	Mg II	2 h	11625.16	Be II
7	10683.034	Ar II	9	10913.05	He I	200	11257.711	Kr I	4	11626.4	He II
200	10683.08	C I	11	10914.23	Mg II	150	11259.126	Kr I	5	11627.91	Pb II
400	10684.46	Ce III	200	10914.88	Sr II	150	11266.23	Sb I	23	11628.83	C I
300	10691.25	C I	7	10915.27	Mg II	56	11277.66	Sn I	160	11638.26	Fe I
30	10694.251	Si I	3	10917.10	He I	590	11286.34	O I	3000	11646.78	Pa
500	10716.58	Pr III	1880	10918.34	Te I	640	11286.91	O I	15	11655	Cd I
60 h	10717.42	In I	3000	10923.32	Pa I	490	11287.02	O I	13	11658.85	C I
15	10723.92	Th II	12	10937.90	La III	490	11287.32	O I		11659.	Be II
20	10726.93	Th I	12	10938.1	H I	240	11287.40	Hg I	47	11659.68	C I
30	10727.408	Si I	20	10942.24	Th II	240	11287.407	Hg I	800	11660.04	B I
30	10733.87	Ar I	8	10947.416	Ge I	12	11289.84	Si I	2	11660.25	Be II
8	10734.068	Ge I	10	10951.78	Mg II	10000 l	11293.14	Bk I	570	11662.47	B I
800	10741.94	Sb I	25	10953.32	Mg I	24	11293.40	Ge I	200	11668.710	Ar I
1000	10742.14	Br I	1	10955.71	Cl II	50	11294.13	U I	24	11669.63	C I
100 h	10744.31	In I	27	10957.30	Mg I	490	11295.10	O I	76	11670.77	Sn I
10	10746.44	Na I	28	10965.45	Mg I	540	11297.68	O I	10000	11681.85	Cf
9	10749.29	Na I	10	10968.27	Ga I	10000	11300.19	Cf	300	11688.002	Ne I
60	10749.384	Si I	40	10969.53	Pb I	590	11302.38	O I	230	11689.98	Fe I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
17	11690.21	K I	600	11997.105	Kr I	100	12456.12	Ar I	187	12981.7	Sn I
25	11694.45	Sn I	40	11999.49	Bi I	800	12459.389	Ne I	2	12984.89	He I
10000 l	11695.15	Np I	48	12009.50	Sn I	510	12461.25	N I	120	12990.77	O I
120 h	11697.45	Ba I	100	12014.76	Sr II	490	12464.02	O I	20	13000.3	Sn I
15	11703.46	Th I	10000	12017.85	Cm I	10000	12464.99	Cm I	10000	13004.56	Cm I
10000	11707.73	Cm I	15	12018.72	Th I	2	12466.75	Sb I	200	13008.264	Ar I
1500 d	11710.37	Bi I	172	12021.7	Cl I	920	12469.62	N I	700	13013.2	Tl I
600	11714.76	Ge I	10	12025.64	Ge I	15	12477.30	Th I	187	13018.5	Sn I
12	11719.488	Ar I	440	12031.51	Si I	20	12479.60	Sr I	15	13028.64	Ge I
180	11720.56	Cl I	300	12033.69	I I	200	12487.663	Ar I	30	13033.57	Ca I
20	11731.48	In I	10	12055.49	Ge I	15	12491.8	Tl I	100	13053.63	Zn I
258	11739.78	Sn I	30	12061.41	Ge I	40	12495.00	Sr I	50	13057.50	Ga I
90	11742.01	Xe I	45	12065.76	Ge I		12522.11	K I	10000	13061.13	Bk I
85	11748.22	C I	3000	12066.334	Ne I	20	12527.52	He I	160	13076.91	O I
142	11753.32	C I	1300	12069.20	Ge I	42	12530.87	Sn I	68	13081.5	Sn I
114	11754.76	C I	200	12074.51	N I	42	12536.5	Sn I	21	13086.44	Ca I
2000	11766.792	Ne I	160	12077.224	Kr I	48	12540.41	Ge I	25	13088.28	U I
16	11769.62	K I	30	12083.66	Mg I	10	12551.0	Ag I	400	13104.18	Te I
17	11772.83	K I	100	12095.36	Be II	1	12561.37	Pb I	235	13107.61	Ge I
10000 l	11776.64	Np I	30	12098.18	Be II	188	12566.24	Te I	570	13123.41	Al I
11	11777.54	C I	150	12103.53	Si I	450	12570.04	O I	100	13123.80	Sr II
320	11778.34	I I	200	12109.78	Ga I	389	12589.19	Te I	24	13134.95	Ca I
10000	11780.95	Cm I	200	12112.326	Ar I	300	12590.20	Xe I	15	13145.90	Th II
160	11783.26	Fe I	5	12116.06	Sb I	26	12614.10	C I	60	13149.16	I I
20	11784.72	U II	20	12127.30	Th I	2500	12623.391	Xe I	100	13150.59	Zn I
1500	11789.044	Ne I	50	12139.738	Ar I	15	12636.80	Ge I	450	13150.76	Al I
500	11789.889	Ne I	3000	12144.46	Pu I	15	12638.71	Fe I	700	13163.89	O I
10000	11791.73	Pa I	10000 s	12148.18	Np I	20	12646.54	Th I	750	13164.85	O I
150	11792.425	Kr I	10000 s	12159.05	Bk I	15	12652.20	Sr I	640	13165.11	O I
10000 s	11793.09	Bk I	200	12165.08	Bi I	150	12676.58	Ge I	11	13176.90	Si I
1500	11819.377	Kr I	10000 l	12183.05	Cf	40	12681.28	Ge I	1100	13177.412	Kr I
96	11825.18	Sn I	380	12186.82	N I	1000	12689.201	Ne I	100	13185.16	U I
45	11828.18	Mg I	20	12194.16	Th II	200	12690.04	Bi I	20	13196.61	Zn I
10000	11834.28	Cm I	30	12198.88	Ge I	150	12702.281	Ar I	120	13207.30	Ba I
106	11835.82	Sn I	15	12206.89	Th I	30	12733.418	Ar I	120	13209.95	Hg I
20	11838.99	Ca II	20	12207.73	Ge I	150	12736.4	Tl I	200	13213.99	Ar I
10	11839.77	Ge I	3000	12231.22	Pu I	12	12746.232	Ar I	1700	13217.17	Br I
100	11859.42	U I	20	12231.94	Th I	15	12756.96	Ce III	700	13219.241	Ne I
30	11863.37	Sb I		12232.	Li I		12782.	Li I	200	13228.107	Ar I
15	11864.25	Th I	375	12235.24	Xe I	50	12784.99	He I	100	13230.90	Ar I
195	11866.76	Cl I	20	12236.20	Sr I	10000 l	12787.41	Cf	3000	13234.09	Pa
580	11882.84	Fe I	100	12250.46	U I	37	12788.2	Sn I	100	13235.17	Rb I
225	11884.08	Fe I	100	12257.76	Xe I	20	12790.57	He I	350	13243.8	Cl I
17	11892.91	C I	120	12270.68	Si I	115	12800.66	Ge I	1580	13247.75	Te I
30	11895.75	C I	2	12276.6	Sb I	200	12802.739	Ar I	10000	13258.18	Cm I
100	11908.83	U I	3000	12279.01	Pa	161	12805.50	Te I	500	13272.64	Ar I
55	11917.01	Ge I	60	12286.75	Ge I	25	12816.04	Ca I	10000	13289.84	Cm I
254	11932.99	Sn I	225	12288.97	N I	100	12817.8	Bi I	310	13296.0	Cl I
125	11934.56	Se I	150	12304.58	I I	20	12818.1	H I	75	13306.23	U I
15	11940.64	Th I	111	12313.24	Sn I	12	12821.62	Ce III	1000	13313.210	Ar I
10000	11941.33	Cf	290	12328.76	N I	24	12823.86	Ca I	483	13316.63	Te I
275	11946.87	Se I	33	12335.6	Sn I	175	12836.38	Ge I	10000 l	13329.98	Cf
100	11947.92	Se I	15	12338.00	Th I	7	12845.96	He I	10000	13344.62	Cm I
400	11949.12	Ga I	55	12338.76	Ge I	12	12847.92	Ge I	550	13346.8	Cl I
10	11949.72	Ca II	50	12343.393	Ar I	100	12861.892	Kr I	10000 s	13362.98	Cf
105	11952.27	Se I	10000 s	12352.72	Cf	15	12866.64	Th I	1000	13367.111	Ar I
170	11952.64	Se I	10	12374.64	Bi I	14	12879.76	Fe I	10000 l	13376.89	Cf
1	11957.7	Sb I	10000 s	12377.42	Np I	40	12885.05	Ga I		13377.86	K I
100	11966.04	Se I	310	12381.65	N I	89	12888.5	Sn I		13397.09	K I
30	11969.12	He I	1050	12391.58	Ge I	25	12909.10	Ca I	140	13426.57	Hg I
205	11972.93	Se I	10000	12394.16	Cm I	1100	12912.014	Ne I	500	13429.61	N I
1030	11973.05	Fe I	200	12402.827	Ar I	10	12912.59	In I	9	13429.96	In I
115	11973.07	Se I	10000 l	12407.99	Np I	50	12933.195	Ar I	20	13442.81	Rb I
280	11978.96	Te I		12432.24	K I	15	12940.65	Th II	30	13443.57	Rb I
370	11984.19	Si I	10000 s	12437.48	Cf	120	12955.73	Ge I	378	13460.2	Sn I
20	11984.67	Th II	180	12438.40	N I	500	12956.659	Ar I	60	13468.38	Hg I
1000	11984.912	Ne I	200	12439.321	Ar I	15	12959.82	Th I	10000 l	13474.44	Cf
220	11991.57	Si I	60	12445.90	Sr II	10	12968.45	He I	10000	13480.54	Cm I
450	11996.86	I I	10000	12454.98	Cm I	75	12974.70	Sr II	20	13492.28	Ge I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
	13495.3	Pb I	24	14285.11	Fe I	50	14982.75	Ga I	80	15712	Cd I
	13498.2	Pb I	200	14287.02	I I	60	14996.64	Ga I	14	15723.59	Fe I
10000	13498.36	Bk I	14	14292.38	Fe I	120	15000.40	Ba I	1487	15730.1	Cl I
30	13499.41	Ar I	42	14297.15	Ge I	15	15001.75	Ge I	6	15740.71	Mg I
20	13502.27	C I	16	14308.69	Fe I	120	15005.307	Kr I	8	15748.99	Mg I
1000	13504.191	Ar I	6	14316.25	In I	10000	15018.13	Cm I	10000	15757.23	Cm I
80	13505.58	Hg I	200	14330.5	Bi I	13	15018.2	Sn I	10	15765.84	Mg I
	13512.6	Pb I	5000	14332.88	Gd III	35	15024.99	Mg I	41	15769.42	Fe I
10000	13522.40	Pa	10000	14334.52	Cm I	225	15032.57	I I	10000	15793.31	Cm I
15	13522.80	Sr I	434	14335.74	Te I	30	15040.24	Mg I	28	15813.13	Fe I
42	13534.85	Ge I	10000	14344.76	Pa I	13	15041.21	Ge I	193	15818.4	Cl I
250	13544.15	Xe I	1800	14354.57	Br I	100	15046.50	Ar I	120	15820.09	Kr I
17	13565.04	Fe I	375	14364.99	Xe I	25	15047.70	Mg I	15	15831.75	Th I
15	13565.67	Th I	148	14369.7	Cl I	37	15051.77	Fe I	80	15847.58	Ce III
	13566.	Li I	38	14399.65	C I	12	15083.64	He I	2780	15869.7	Cl I
500	13570.21	Hg I	96	14400.56	Fe I	100	15099.72	Xe I	277	15883.3	Cl I
11	13573.617	Ar I	180	14402.22	Kr I	269	15108.0	Cl I	190	15888.39	Si I
840	13581.33	N I	16	14403.25	C I	10000	15136.10	Bk I	342	15928.9	Cl I
180	13587.73	N I	220	14417.46	Te I	500	15151.44	Se I	80	15956.79	Ce III
140	13588.31	Cs I	3	14419.20	In I		15163.08	K I	735	15960.0	Cl I
10000	13590.01	Cm I	61	14420.12	C I		15168.40	K I	40	15960.04	Si I
30	13599.333	Ar I	15	14424.54	Th I	25	15172.69	Ar I	12	15960.59	Ce III
180	13602.27	N I	2000	14426.793	Kr I	28	15207.55	Fe I	283	15970.5	Cl I
15	13602.57	Cs I	12	14429.03	C I	140	15209.526	Kr I	250	15979.54	Xe I
144	13608.2	Sn I	13	14442.24	C I	10000	15222.27	Cm I	30	15989.49	Ar I
1000	13622.415	Kr I	20	14442.28	Fe I	800	15230.714	Ne I	50	16001.5	Bi I
400	13622.659	Ar I	100	14460.00	I I	1700	15239.615	Kr I	10000	16008.41	Cm I
290	13624.18	N I	35	14491	Cd I	15	15240.24	Th II	150	16037.33	I I
2400	13634.220	Kr I	72	14512.23	Fe I	10000 s	15281.32	Cf	100	16039.90	Xe I
10000	13644.77	Cm I	1050	14513.51	Te I	800	15288.43	Rb I	1000	16053.28	Xe I
2000	13657.055	Xe I	100	14517.84	Kr I	150	15289.48	Rb I	95	16060.03	Si I
800	13658.394	Kr I	129	14554.68	Te I	94	15294.58	Fe I	129	16077.6	Cl I
75	13665.01	Rb I	50	14555.06	Fe I	500	15295.82	Hg I	20	16094.80	Si I
450	13673.51	Hg I	10000	14563.41	Cm I		15314.8	Pb I	87	16128.75	Ce III
200	13678.550	Ar I	14	14565.95	Fe I	130	15326.480	Kr I	20	16150.77	Ca I
200	13711.036	Kr I	40	14569.84	Ge I		15327.6	Pb I	22	16157.36	Ca I
1000	13718.577	Ar I	10000	14580.23	Cm I	10	15329.34	Ar I	200	16157.72	Be I
28	13724.48	Ge I	15	14618.98	Th I		15331.0	Pb I	60	16163.71	Si I
600	13738.851	Kr I	100	14643.92	Be I	1500	15334.958	Kr I	21	16197.04	Ca I
15	13758.83	Cs I	60	14644.75	Be I	16	15335.40	Fe I	259	16198.5	Cl I
10000	13789.52	Cm I	15	14654.91	Th I		15349.6	Pb I	160	16212.06	O I
120	13810.50	Ba I	140	14660.81	Xe I	700	15372.037	Kr I	11	16215.68	Si I
525	13821.7	Cl I	12	14667.52	Ge I	3000	15377.31	Pu I	200	16240.38	B I
5	13824.48	In I	6	14668.66	In I	2500	15418.394	Xe I	250	16244.67	B I
10	13825.715	Ar I	350	14694.93	Cs I	15	15429.78	Th I	16	16381.55	Si I
10000 l	13834.33	Np I	7	14719.08	In I	1480	15452.45	Te I	3760	16403.90	Te I
10000	13840.18	Cm I		14722.8	Pb I	30	15464.2	Sn I	14	16424.77	Ge I
10	13907.478	Ar I	3000	14732.806	Xe I	381	15465.1	Cl I	13	16444.82	Fe I
10000	13908.46	Cm I	1600	14734.436	Kr I	169	15467.6	Cl I	20	16483.45	Zn I
200	13950.55	Hg I		14742.1	Pb I	115	15469.06	Se I	20	16486.69	Fe I
140	13958.27	I I		14743.0	Pb I	320	15471.00	Se I	20	16491.98	Zn I
100	13961.58	U I	1000	14752.41	Rb I	200	15474.026	Kr I	2	16504.31	In I
10000	13964.14	Cm I	250	14757.07	N I	20	15504.34	Ge I	20	16505.23	Zn I
150	13974.027	Kr I	550	14762.672	Kr I	1094	15520.3	Cl I	30	16519.86	Ar I
217	14037.09	Te I	450	14765.472	Kr I	265	15520.97	Se I	125	16554.49	Xe I
100	14038.70	Zn I	115	14767.48	Na I	105	15528.65	I I	12	16559.66	C I
550	14045.657	Kr I	10000 l	14772.49	Cf	2430	15546.23	Te I	12	16626.64	Ge I
144	14072.53	Te I	315	14817.93	Se I	150	15557.13	Xe I	360	16659.44	Se I
120	14077.90	Ba I	470	14822.38	Ge I	180	15582.27	N I	29	16680.77	Si I
15	14090.25	Th I	40	14826.43	Fe I	10000	15587.12	Cf	70	16699.29	Ge I
200	14093.640	Ar I	100	14868.87	N I	395	15618.40	Se I	230	16718.96	Al I
140	14104.298	Kr I	28	14877.62	Mg I	115	15620.38	Se I	200	16726.513	Kr I
42	14116.70	Ge I	1250	14888.70	Br I	30	15621.67	Fe I	1500	16728.15	Xe I
1250	14142.444	Xe I	410	14917.47	Se I	125	15629.08	B I	1800	16731.19	Br I
15	14168.67	Th I	16	14921.97	Ge I	25	15631.97	Fe I	300	16750.56	Al I
10000 s	14196.93	Bk I	294	14931.7	Cl I	10000	15642.59	Cm I	10000	16759.06	Cf
10000	14235.27	Cm I	15	14940.49	Th II	10000	15675.92	Cf	150	16759.79	Ge I
30	14236.25	Fe I	400	14961.894	Kr I	20	15680.29	Zn I	140	16763.36	Al I
800	14240.96	Xe I	160	14966.60	N I	180	15681.02	Kr I	2000	16785.128	Kr I

Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength		Intensity	Wavelength	
505	16813.78	Se I	590	18021.21	O I	30	19046.14	Ca I	20	20622.2	Sn I
165	16817.76	Se I	400	18035.80	Ne I	10000 h	19068.71	Cf	1000	20624.67	Br I
60	16819.5	Ag I	120	18041.48	O I	35	19070.17	I I	10	20634.36	Th I
1000	16853.488	Kr I	120	18042.19	O I	100	19089.38	He I	10	20648.69	I I
205	16866.54	Se I	120	18046.23	O I	110	19105.12	I I	28	20673.64	Ge I
100	16881.48	Hg I	10000	18069.02	Cm I	25	19113.68	Fe I	30	20685.63	Ce III
50	16890.38	C I	1000	18083.21	Ne I	55 d	19125	Cd I	10	20690.64	U I
2400	16890.441	Kr I	50	18130.38	Hg I	38	19141.29	Ce III	10	20692.06	Th II
1600	16896.753	Kr I	50	18136.65	U I	15	19145.60	Th II	120	20700.70	Sr I
3000	16897.38	Pu I	13	18139.80	C I	25	19162.53	Cs I	120	20712.00	Ba I
50	16906.00	U I	100	18143.54	Be I	20	19163.20	Cs I	40	20764.50	Sr I
400	16920.16	Hg I	2600	18167.315	Kr I	10000 l	19273.87	Bk I	10	20772.19	U I
1800	16935.806	Kr I	350	18221.11	Ne I	62	19279.24	Ge I	15	20778.70	Sr I
500	16940.58	Ar I	250	18227.02	Ne I		19290.	Li I	10000	20853.49	Cm I
300	16942.00	Hg I	140	18229.23	O I	48	19309.20	Ca I	40	20861.7	Sn I
115	16972.71	Se I	540	18243.63	O I	10000 l	19336.96	Cf	10000 s	20869.98	Cf
20	17000.5	Sn I	15	18275.71	I I	15	19338.98	Th II	10000	20911.52	Cm I
200	17002.47	He I	2500	18276.68	Ne I	50	19370.02	I I	12	20917.13	Si I
500	17072.79	Hg I	2000	18282.62	Ne I	227	19370.3	Cl I	10000	20968.11	Cm I
600	17098.771	Kr I	2780	18291.59	Te I	27	19377.15	Ce III	30	20985.81	Sc
30	17108.66	Mg I	1200	18303.97	Ne I	15	19385.94	Si I	30	20986.11	Ar I
400	17109.93	Hg I	15	18307.9	Ag I	48	19432.97	Si I	10	21008.38	U I
20	17116.75	Hg I	20	18348.52	I I	49	19452.99	Ca I	1200	21041.295	Ne I
15	17140.90	Sr I	10000	18352.31	Bk	26	19466.14	Ce III	1020	21043.73	Te I
10000	17148.22	Cm I	250	18359.12	Ne I	13	19493.38	Si I	300	21093.04	Al I
400	17161.930	Ne I	50	18366.96	U I	20	19498.14	Ce III	10	21099.98	U I
30	17170.50	Sr I	15	18382.3	Ag I	47	19505.72	Ca I	10	21112.14	U I
20	17198.67	Hg I	1200	18384.85	Ne I	55	19524.18	Ce III	80	21120.07	He I
20	17208.22	Th II	2000	18389.95	Ne I	20	19543.08	He I	10	21121.43	He I
20	17213.20	Hg I	100	18399.786	Kr I	10000	19572.62	Cm I	20	21132.03	He I
135	17214.34	Ge I	1000	18402.84	Ne I	10000 l	19576.84	Cf	20	21144.90	U II
1960	17303.54	Te I	1200	18422.39	Ne I	269	19623.52	Te I	360	21163.75	Al I
15	17307.66	Th I	12	18427.76	Ar I	10000 s	19653.22	Bk I	600	21165.471	Kr I
1500	17325.77	Xe I	16	18428.30	Ge I	40	19700.17	Hg I	10000	21241.06	Cm I
28	17327.29	Si I	300	18458.65	Ne I	23	19721.99	C I	800	21259.44	Gd III
70	17329.41	Hg I	400	18475.79	Ne I	110	19722.50	Si I	50	21311.46	Cs I
10	17338.56	C I	3000	18478.61	Pa I	3500	19733.62	Br I	45	21312.29	Cs I
700	17367.606	Kr I	35	18495.54	Ge I	717	19755.3	Cl I	21	21354.24	Si I
15	17381.91	Th I	1	18555.55	He I	15	19759.60	Sr I	235	21374.24	Se I
120	17404.443	Kr I	1200	18568.31	Br I	185	19766.8	Cl I	12	21380.23	Ce III
20	17416.7	Ag I	42	18579.82	Ce III	10	19774.30	Th II		21389.00	Ca II
30	17436.18	Hg I	150	18580.896	Kr I	50	19776.79	Ca I	10000	21393.23	Cm I
50	17447.40	Sr I	900	18591.55	Ne I	22	19791.88	Fe I		21428.90	Ca II
11	17448.60	C I	1600	18597.70	Ne I	35	19853.10	Ca I	680	21442.56	Se I
50	17451.11	U I	350	18618.96	Ne I	34	19862.22	Ca I	250	21470.09	Xe I
10000	17453.18	Cm I	550	18625.16	Ne I	23	19917.19	Ca I	415	21473.48	Se I
2000	17474.78	Gd III	75	18634.43	U I	31	19928.88	Si I	4	21518.30	Ge I
15	17481.04	Th I	6	18636.8	He II	24	19933.70	Ca I	464	21602.50	Te I
120 s	17516.58	N I	500	18685.34	He I	10000	19975.98	Cm I	5	21655.3	H I
	17552.	Li I	300	18696.294	Kr I	800	19996.34	Gd III	10	21674.51	U I
15	17584.52	Th I		18697.	Li I	239	20147.54	Te I	8	21686.2	Sn I
100 l	17584.86	N I	200	18697.23	He I	150	20187.19	Xe I	10	21693.38	U I
150	17616.854	Kr I	10000 l	18718.69	Cf	227	20199.4	Cl I	750	21708.145	Ne I
10000	17619.28	Cm I	26	18722.90	Si I	10	20201.13	U I	270	21716.36	Se I
4	17626.00	Sr II	40	18751.0	H I	140	20209.878	Kr I	240	21730.60	Se I
10000 s	17626.25	Cf	10	18764.11	Ge I	230	20261.40	Sr I	1200	21787.24	Br I
30	17743.00	Sr I	394	18777.30	Te I	3000	20262.242	Xe I	37	21799.64	Te I
20	17757.91	Ga I	170	18785.460	Kr I	10	20271.41	U I	1800	21902.513	Kr I
10	17807.5	Sn I	350	18788.13	Xe I	1000	20281.73	Br I	75	21910.22	U I
650	17842.737	Kr I	200	18797.703	Kr I	85	20370.1	Cl I	60	22016.81	Ga I
80	17855.38	Be I	70	18811.86	Ge I	10	20374.13	U I	400	22051.86	Sc I
120	17856.63	Be I	15	18811.88	Th I	10000 l	20393.38	Cf	30	22056.44	Na I
10	17868.96	Ga I	105	18856.65	Fe I	300	20423.964	Kr I	12	22062.71	Si I
100	17878.26	N I	20	18925.47	Ca I	140	20446.971	Kr I	150	22065.05	Sc I
12	17923.62	Cs I	24	18970.14	Ca I	10	20517.29	U I	27	22083.67	Na I
9	17924.21	Cs I	15	18982.41	I I	10000	20526.32	Cm I	9	22091.84	Ge I
15	17936.43	Th II	47	18987.01	Fe I	1000	20581.30	He I	10	22110.73	U I
120	17966.70	O I	235	18994.33	B I	50	20616.23	Ar I	4	22131.7	Sn I
700	18002.229	Kr I	25	19029.39	U I	70	20616.32	Sc	220	22183.03	I I

Intensity	Wavelength	
150	22226.53	I I
300	22247.35	Ne I
10	22264.35	Th II
6	22291.06	In I
30	22309.21	I I
14	22380.82	Fe I
350	22428.13	Ne I
120	22485.775	Kr I
	22493.28	Hg I
600	22493.33	Gd III
20	22529.65	Rb I
2250	22530.40	Ne I
60	22551.6	Bi I
74	22555.29	Te I
70	22568.71	Ga I
20	22607.93	Ca I
21	22619.85	Fe I
25	22624.93	Ca I
30	22651.23	Ca I
400	22661.81	Ne I
48	22755.66	Te I
4000	22865.65	Br I
10	22932.47	Rb I
3	22997.2	Sn I
600	23100.51	Ne I
20	23133.20	Ar I
105	23133.66	Se I
10	23156.76	U I
1250	23193.33	Xe I
250	23253.07	Hg I
1000	23260.30	Ne I
110	23279.54	Xe I
27	23294.94	Te I
180	23340.416	Kr I
24	23348.41	Na I
1050	23373.00	Ne I
24	23379.13	Na I
150	23388.85	Se I
1000	23513.15	Br I
850	23565.36	Ne I
110	23628.17	Se I
3500	23636.52	Ne I
300	23701.64	Ne I
1100	23709.2	Ne I
7	23879.13	In I
10000 s	23902.85	Bk I
5	23921.92	Ge I
10	23948.19	U I
1800	23951.42	Ne I
600	23956.46	Ne I
20	23966.52	Ar I
1000	23978.12	Ne I
17	23978.70	Te I
5	24044.16	Zn I
25	24059.04	Te I
200	24098.54	Ne I
265	24148.18	Se I
170	24159.23	Se I
500	24161.42	Ne I
10000 s	24192.62	Bk I
185	24204.44	Se I
600	24249.64	Ne I
120	24260.506	Kr I
180	24292.221	Kr I
4	24327.2	Sn I
1500	24365.05	Ne I
800	24371.60	Ne I
10	24375.02	Zn I
25	24378	Cd I
375	24385.99	Se I
160	24413.67	Se I
32	24420.82	I I
400	24447.85	Ne I
700	24459.4	Ne I
	24467.	Li I
100	24470.0	Cl I
225	24471.17	Se I
4	24738.2	Sn I
300	24776.46	Ne I
1800	24824.71	Xe I
550	24928.88	Ne I
255	25017.51	Se I
510	25127.43	Se I
175	25145.84	Xe I
250	25161.69	Ne I
600	25233.820	Kr I
35	25455	Cd I
150	25515.70	Ba I
650	25524.37	Ne I
100	25763.49	Cs I
90	25764.70	Cs I
30	26023.60	Sr I
140	26173.56	O I
38	26222.04	Fe I
8	26251.5	H I
2000	26269.08	Xe I
5	26392.90	Mg I
13	26428.62	Te I
2500	26510.86	Xe I
38	26539.17	Te I
15	26553.74	Te I
17	26659.22	Fe I
7	27179.26	Te I
4	27314.31	Rb I
12	27365.42	I I
9	27573.05	I I
2	27905.37	Rb I
500	28346.50	Br I
250	28381.54	Xe I
125	28386.21	Ne I
750	28582.25	Xe I
180	28610.55	Kr I
1000	28655.72	Kr I
150	28769.71	Kr I
140	28822.49	Kr I
150	29223.90	Ba I
300	29236.69	Kr I
300	29384.41	Xe I
150	29448.06	Xe I
10	29557.07	U I
100	29649.58	Xe I
100	29813.62	Xe I
150	30200.	Ne I
600	30253.14	Xe I
10	30361.93	I I
500	30380.85	Br I
8	30383.88	I I
1500	30475.46	Xe I
100	30504.12	Xe I
300	30663.54	Kr I
500	30794.18	Xe I
3	30908.5	He II
300	30979.16	Kr I
6000	31069.23	Xe I
125	31336.01	Xe I
550	31607.91	Xe I
600	31630.13	Br I
160	31775.05	Be I
200	31778.70	Be I
	32148.06	Hg I
100	32293.08	Xe I
120	32693.90	Br I
1800	32739.26	Xe I
250	33173.09	Ne I
450	33352.35	Ne I
3500	33666.69	Xe I
1300	33901.	Ne I
2200	33912.10	Ne I
150	34014.67	Xe I
600	34131.31	Ne I
150	34181.87	Br I
10	34295.73	I I
450	34335.27	Xe I
100	34471.44	Ne I
9	34513.11	I I
170	34744.00	Xe I
5000	35070.25	Xe I
110	35246.92	Xe I
120	35834.78	Ne I
250	36209.21	Xe I
150	36231.74	Xe I
	36303.03	Hg I
450	36508.36	Xe I
850	36788.83	Xe I
150	38345.75	Br I
140	38685.98	Xe I
175	38737.82	Xe I
	38831.1	Pb I
270	38939.60	Xe I
	38950.1	Pb I
	38958.6	Pb I
	39039.4	Pb I
500	39300.6	Kr I
200	39421.22	Cs I
180	39424.08	Cs I
1100	39486.52	Kr I
220	39557.25	Kr I
100	39572.60	Kr I
1400	39588.4	Kr I
1100	39589.6	Kr I
	39603.7	Cl I
	39615.3	Cl I
	39716.0	Cl I
	39744.0	Cl I
	39750.9	Cl I
	39875.3	Cl I
	39881.0	Cl I
500	39954.8	Kr I
120	39955.14	Xe I
120	39964.36	Br I
300	39966.6	Kr I
	39985.7	Cl I
	40085.5	Cl I
	40089.5	Cl I
	40158.37	K I
	40171.0	Cl I
3	40228.54	I I
1300	40306.1	Kr I
	40310.3	Cl I
	40335.4	Cl I
	40475.	Li I
4	40478.90	He I
15	40511.6	H I
	40532.2	Cl I
250	40685.16	Kr I
2	41633.80	I I
4	46525.1	H I
6	74578	H I
3	123685	H I

Part II. Transition Probabilities

W. L. Wiese and G. A. Martin

These tables were prepared under the auspices of the Committee on Line Spectra of the Elements of the National Academy of Sciences—National Research Council. They contain critically evaluated atomic transition probabilities for about 5000 selected lines of all elements for which reliable data are available on an absolute scale. The material is largely for neutral and singly ionized spectra, but includes a number of prominent lines of more highly charged ions.

Many of the data are obtained from comprehensive compilations of the National Bureau of Standards Data Center on Atomic Transition Probabilities. Specifically, data have been taken from critical compilations on V [1], Cr [1], Mn [1], Fe [2], Co [2], and Ni [2] without changes. Material from earlier compilations for the elements H through Ne [3], Na through Ca [4], and Sc and Ti [5] was supplemented by more recent material taken directly from the original literature. For the higher ions, many data were derived from studies of the systematic behavior of transition probabilities [6–8]. The original literature is cited in a recent bibliography [9]; thus, individual literature references are not cited here.

The wavelength range for the neutral species has normally been restricted to the visible or shorter wavelengths; only the very prominent near infrared lines are included. For the higher ions, most of the strong lines are located in the far uv. The tabulation is limited to electric dipole—including intercombination—lines and comprises essentially the fairly strong transitions with estimated uncertainties of 50% or less. With the exception of hydrogen, helium, and the alkalis, most transitions are between states with low principal quantum numbers.

The transition probability, A, is given in units of 10^8 s^{-1} and is listed to as many digits as is consistent with the indicated accuracy. A number in parentheses following the tabulated value of the transition probability indicates the power of ten by which this value has to be multiplied. The estimated uncertainties of the A-values are indicated by code letters as follows: AA—for uncertainties within 1%; A—within 3%; B—within 10%; C—within 25%; D—within 50%.

Each transition is identified by the wavelength, λ, in Ångstroms; the energy level of the upper atomic state, E_k, in cm^{-1}; and the statistical weights, g_i and g_k, of the lower (i) and upper (k) states (the product $g_k A$ (or $g_i f$) is needed in many applications). Whenever the wavelengths of individual lines within a multiplet are extremely close, an average wavelength for the multiplet is given, and is indicated by an asterisk (*) to the right of the g_k value. This has also been done when the transition probability for an entire multiplet has been taken from the literature and values for individual lines cannot be determined because of insufficient knowledge of the coupling of electrons. Wavelength and energy level data have been taken either from recent compilations or from the original literature cited in bibliographies published by the National Bureau of Standards Atomic Energy Levels Data Center [10,11]. Wavelength values are consistent with those given in Part I of this publication.

In the table for hydrogen, the energy level and uncertainty columns have been eliminated since the transition probabilities and energy levels are known very precisely for this element. Because of the hydrogen degeneracy, a "transition" is actually the sum of all transitions between the principal quantum numbers listed in the transition column, and the tabulation represents the properly weighted A values.

In addition to the transition probability A, the atomic oscillator-strength f and the line-strength S are often used in the literature. The conversion factors between these quantities are:

$$g_i f = 1.499 \times 10^{-8} \lambda^2 g_k A = 303.8 \lambda^{-1} S,$$

where λ is in Ångstroms, A is in 10^8 s^{-1}, and S is in atomic units, which are $a_0^2 e^2 = 7.188 \times 10^{-59}$ $m^2 C^2$ for electric dipole transitions.

We acknowledge the valuable preparatory work by D. Trahan, W. Croom, and F. Farley in arranging and compiling the numerical data.

TABLE 1a. Transition probabilities for allowed lines of hydrogen

Wavelength λ[Å]	Transition	Statistical weights g_i	g_k	Average transition probability A [10^8 s^{-1}]
914.039	1–20	2	800	3.928(–5)
914.286	1–19	2	722	5.077(–5)
914.576	1–18	2	648	6.654(–5)
914.919	1–17	2	578	8.858(–5)
915.329	1–16	2	512	1.200(–4)
915.824	1–15	2	450	1.657(–4)
916.429	1–14	2	392	2.341(–4)
917.181	1–13	2	338	3.393(–4)
918.129	1–12	2	288	5.066(–4)
919.351	1–11	2	242	7.834(–4)
920.963	1–10	2	200	1.263(–3)
923.150	1– 9	2	162	2.143(–3)
926.226	1– 8	2	128	3.869(–3)
930.748	1– 7	2	98	7.568(–3)
937.803	1– 6(Lε)	2	72	1.644(–2)
949.743	1– 5(Lδ)	2	50	4.125(–2)
972.537	1– 4(Lγ)	2	32	1.278(–1)
1025.72	1– 3(Lβ)	2	18	5.575(–1)
1215.67	1– 2(Lα)	2	8	4.699
3682.81	2–20	8	800	2.172(–5)
3686.83	2–19	8	722	2.809(–5)
3691.55	2–18	8	648	3.685(–5)
3697.15	2–17	8	578	4.910(–5)
3703.85	2–16	8	512	6.658(–5)
3711.97	2–15	8	450	9.210(–5)
3721.94	2–14	8	392	1.303(–4)
3734.37	2–13	8	338	1.893(–4)
3750.15	2–12	8	288	2.834(–4)
3770.63	2–11	8	242	4.397(–4)
3797.90	2–10	8	200	7.122(–4)
3835.38	2– 9	8	162	1.216(–3)
3889.05	2– 8	8	128	2.215(–3)
3970.07	2– 7(Hε)	8	98	4.389(–3)
4101.73	2– 6(Hδ)	8	72	9.732(–3)
4340.46	2– 5(Hγ)	8	50	2.530(–2)
4861.32	2– 4(Hβ)	8	32	8.419(–2)
6562.80	2– 3(Hα)	8	18	4.410(–1)
8392.40	3–20	18	800	1.517(–5)
8413.32	3–19	18	722	1.964(–5)
8437.96	3–18	18	648	2.580(–5)
8467.26	3–17	18	578	3.444(–5)
8502.49	3–16	18	512	4.680(–5)
8545.39	3–15	18	450	6.490(–5)
8598.40	3–14	18	392	9.211(–5)
8665.02	3–13	18	338	1.343(–4)

TABLE 1a. Transition probabilities for allowed lines of hydrogen—Continued

Wavelength λ[Å]	Transition	Statistical weights g_i	Statistical weights g_k	Average transition probability A [10^8 s^{-1}]
8750.48	3–12	18	288	2.021(–4)
8862.79	3–11	18	242	3.156(–4)
9014.91	3–10	18	200	5.156(–4)
9229.02	3– 9	18	162	8.905(–4)
9545.97	3– 8(Pε)	18	128	1.651(–3)
10049.4	3– 7(Pδ)	18	98	3.358(–3)
10938.1	3– 6(Pγ)	18	72	7.783(–3)
12818.1	3– 5(Pβ)	18	50	2.201(–2)
16407.2	4–12	32	288	1.620(–4)
16806.5	4–11	32	242	2.556(–4)
17362.1	4–10	32	200	4.235(–4)
18174.1	4– 9	32	162	7.459(–4)
18751.0	3– 4(Pα)	18	32	8.986(–2)
19445.6	4– 8	32	128	1.424(–3)
21655.3	4– 7	32	98	3.041(–3)
26251.5	4– 6	32	72	7.711(–3)
27575	5–12	50	288	1.402(–4)
28722	5–11	50	242	2.246(–4)
30384	5–10	50	200	3.800(–4)
32961	5– 9	50	162	6.908(–4)
37395	5– 8	50	128	1.388(–3)
40511.5	4– 5	32	50	2.699(–2)
43753	6–12	72	288	1.288(–4)
46525	5– 7	50	98	3.253(–3)
46712	6–11	72	242	2.110(–4)
51273	6–10	72	200	3.688(–4)
59066	6– 9	72	162	7.065(–4)
74578	5– 6	50	72	1.025(–2)
75004	6– 8	72	128	1.561(–3)
123680	6– 7	72	98	4.561(–3)

For hydrogen-like ions of nuclear charge Z, the following scaling laws hold:

$$A_Z = Z^4 A_{\text{Hydrogen}};\ f_Z = f_H;\ S_Z = Z^{-2} S_H$$

(For wavelengths $\lambda_Z = Z^{-2}\ \lambda_H$).

For very highly charged ions, relativistic effects need to be taken into account [12].

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TABLE 1b. Transition probabilities for selected atomic and ionic species

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Aluminum				
	Al I				
2263.5	44166	2	4	.66	C
2269.1	44169	4	6	.79	C
2269.2	44166	4	4	.13	C
2367.1	42234	2	4	.72	C
2373.1	42238	4	6	.86	C
2373.4	42234	4	4	.14	C
2568.0	38929	2	4	.23	C
2575.1	38934	4	6	.28	C
2575.4	38929	4	4	.044	C
2652.5	37689	2	2	.133	C
2660.4	37689	4	2	.264	C
3082.2	32435	2	4	.63	C
3092.7	32437	4	6	.74	C
3092.8	32435	4	4	.12	C
3944.0	25348	2	2	.493	C
3961.5	25348	4	2	.98	C
6696.0	40278	2	4	.0169	C
6698.7	40272	2	2	.0169	C
7835.3	45195	4	6	.057	D
7836.1	45195	6	8	.062	D
	Al II				
1047.9	132823	1	3	.36	D
1048.6	132823	3	5	.48	D
1539.8	124794	3	5	8.8	D
1670.8	59852	1	3	14.6	B
1719.4	95551	1	3	6.79	B
1764.0	94269	5	5	9.8	C
1772.8	150493	1	3	9.5	D
1777.0	150544	5	7	17.	D
1819.0	150525	15	15*	5.6	D
1855.9	91275	1	3	.832	B
1858.0	91275	3	3	2.48	B
1862.3	91275	5	3	4.12	B
1931.0	111637	3	1	10.8	C
1990.5	110090	3	5	14.7	C
2816.2	95351	3	1	3.83	C
4663.1	106921	5	3	.53	C
6226.2	121484	1	3	.62	D
6231.8	121484	3	5	.84	D
6243.4	121484	5	7	1.1	D
6335.7	125869	5	3	.14	D
6823.4	120093	3	3	.34	D
6837.1	120093	5	3	.57	D
6920.3	121367	3	1	.96	D
7042.1	105471	3	5	.59	C
7056.7	105442	3	3	.58	C
7471.4	123471	5	7	.94	D
	Al III				
560.36	178458	2	6*	.40	D
695.83	143714	2	4	.74	C
696.22	143633	2	2	.72	C
1352.8	189876	10	14*	4.40	C
1379.7	126164	2	2	4.59	C
1384.1	126164	4	2	9.1	C
1605.8	115959	2	4	12.2	B
1611.8	115959	4	4	2.42	B
1611.9	115956	4	6	14.5	B
1854.7	53917	2	4	5.40	B
1862.8	53683	2	2	5.33	B
	Al III				
1935.9	167613	10	14*	12.2	C
3601.6	143714	6	4	1.34	C
3601.9	143714	4	4	.149	C
3612.4	143633	4	2	1.5	C
	Al X				
39.925	2504700	1	3	2220.	C
51.979	1923850	1	3	4800.	C
55.227	1965860	1	3	5200.	D
55.272	1966030	3	5	7200.	D
55.376	1966270	5	7	9500.	D
59.107	1992340	3	5	4600.	C
332.78	300490	1	3	56.	C
394.83	553783	3	1	83.	C
395.36	409690	3	5	12.	C
397.76	406517	1	3	17.	C
400.43	406517	3	3	13.	C
401.12	409690	5	5	36.	C
403.55	404574	3	1	49.	C
406.31	406517	5	3	19.	C
670.06	449732	3	5	9.8	C
2535.	1923850	1	3	.38	D
	Al XI				
36.675	2726700	2	6*	1500.	C
39.091	2734100	2	4	2600.	C
39.180	2734500	4	6	3100.	C
39.530	2705700	2	2	180.	D
39.623	2705700	4	2	370.	D
48.298	2070520	2	4	3090.	B
48.338	2068770	2	2	3080.	B
52.299	2088100	2	4	8100.	C
52.446	2088530	4	6	9600.	C
52.458	2088100	4	4	1600.	C
54.217	2020450	2	2	480.	C
54.388	2020450	4	2	960.	C
99.083	3029700	2	6*	220.	C
103.6	3033700	2	4	420.	C
103.8	3033700	4	6	500.	C
141.6	2726700	2	6*	407.	C
150.31	2734100	2	4	850.	C
150.61	2734500	4	6	990.	C
157.0	2705700	2	2	130.	C
157.4	2705700	4	2	260.	C
205.0	3193600	2	6*	63.	C
308.6	3029700	2	6*	99.	C
341.3	3019700	6	2*	130.	C
550.05	181808	2	4	8.55	B
568.12	176019	2	2	7.73	B
1997.	2070520	2	4	1.07	C
2069.	2068770	2	2	.97	C
4761.	2726700	2	6*	.255	C
5172.	2088100	2	4	.0395	C
5551.	2088530	4	6	.0385	C
5687.	2088100	4	4	.0060	D
	Argon				
	Ar I				
3554.3	121271	5	5	.0029	D
3567.7	121165	5	7	.0012	D
3606.5	121470	3	1	.0081	D
3649.8	122791	3	1	.0085	D
3834.7	121470	3	1	.0080	D

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Ar I				
3949.0	118460	5	3	.00467	C
4044.4	118469	3	5	.00346	C
4158.6	117184	5	5	.0145	C
4164.2	117151	5	3	.00295	C
4181.9	118460	1	3	.0058	C
4190.7	116999	5	5	.00254	C
4191.0	118407	1	3	.0056	C
4198.3	117563	3	1	.0276	C
4200.7	116943	5	7	.0103	C
4259.4	118871	3	1	.0415	C
4266.3	117184	3	5	.00333	C
4272.2	117151	3	3	.0084	C
4300.1	116999	3	5	.00394	C
4333.6	118469	3	5	.0060	C
4335.3	118460	3	3	.00387	C
4345.2	118407	3	3	.00313	C
4510.7	117563	3	1	.0123	C
4768.7	125066	3	5	.0090	D
4836.7	124772	3	5	.00106	C
4876.3	124604	3	5	.0081	D
4887.9	124555	3	3	.014	D
4894.7	124527	3	1	.019	D
5048.8	123903	3	5	.0048	D
5054.2	123882	3	3	.0047	D
5056.5	123873	3	1	.0059	D
5118.2	125150	5	7	.0028	D
5151.4	123509	3	1	.0249	C
5152.3	123505	3	5	.0011	D
5162.3	123468	3	3	.0198	C
5177.5	124772	7	5	.0025	D
5187.7	123373	3	5	.0138	C
5194.1	125335	3	1	.0081	D
5210.5	124650	7	7	.0011	D
5214.8	124788	5	3	.0022	D
5216.3	124783	5	3	.0014	D
5221.3	124610	7	9	.0092	D
5241.1	124692	5	5	.0014	D
5252.8	124650	5	7	.0056	D
5373.5	124692	3	5	.0028	D
5394.0	124772	5	5	.0010	D
5410.5	124715	5	7	.0021	D
5421.4	123903	7	5	.0062	D
5440.0	122479	3	3	.0020	D
5442.2	123832	7	7	9.7 (-4)	D
5451.7	122440	3	5	.0049	D
5457.4	123936	5	3	.0037	D
5467.2	123903	5	5	7.9 (-4)	D
5473.5	123882	5	3	.0021	D
5490.1	123827	5	5	8.9 (-4)	D
5495.9	123653	7	9	.0176	C
5506.1	123774	5	7	.0037	D
5525.0	123557	7	7	.0018	D
5534.5	125353	5	3	.0028	D
5558.7	122087	3	5	.0148	C
5559.7	125113	3	5	.0023	D
5572.5	123557	5	7	.0069	C
5588.7	123505	5	5	.0016	D
5606.7	121933	3	3	.0229	C
5618.0	123882	3	3	.0022	D
5620.9	123873	3	1	.0038	D
5623.8	125066	5	5	.0015	D
5635.6	123827	3	5	.0010	D
5639.1	124783	1	3	.0022	D
5641.4	123809	3	5	9.1 (-4)	D
5648.7	123936	5	3	.0013	D
5650.7	121794	3	1	.0333	C
5659.1	123903	5	5	.0027	D
5681.9	123832	5	7	.0021	D
5683.7	123827	5	5	.0021	D
5700.9	123774	5	7	.0061	D
5739.5	123505	3	5	.0091	D
5772.1	123557	5	7	.0021	D
5774.0	124604	5	5	.0011	D
5783.5	123373	3	5	8.4 (-4)	D
5802.1	123468	5	3	.0044	D
5834.3	123373	5	5	.0052	C
5860.3	121161	3	3	.00285	C
5882.6	121097	3	1	.0128	C
5888.6	122440	7	5	.0134	C
5912.1	121012	3	3	.0105	C
5928.8	122479	5	3	.011	D
5940.9	123882	1	3	.0012	D
5942.7	122440	5	5	.0019	D
5949.3	123936	3	3	.0016	D
5968.3	123882	3	3	.0019	D
5971.6	123873	3	1	.011	D
5987.3	122160	7	7	.0013	D
5988.1	123827	3	5	6.4 (-4)	D
5999.0	122282	5	5	.0015	D
6005.7	123936	5	3	.0015	D
6013.7	122087	7	5	.0015	D
6025.2	123882	5	3	.0094	D
6032.1	122036	7	9	.0246	C
6043.2	122160	5	7	.0153	C
6052.7	120619	3	5	.0020	D
6059.4	120601	3	5	.00423	C
6064.8	123774	5	7	6.0 (-4)	D
6090.8	123468	1	3	.0031	D
6098.8	122479	3	3	.0054	D
6101.2	123882	3	3	.0034	D
6104.6	123873	3	1	.0035	D
6105.6	123505	3	5	.0126	C
6127.4	121933	5	3	.0011	D
6128.7	123809	3	5	9.0 (-4)	D
6145.4	123557	5	7	.0079	C
6155.2	122479	5	3	.0053	D
6165.1	123505	5	5	.00103	C
6170.2	122440	5	5	.0052	C
6173.1	122282	3	5	.0070	C
6212.5	122330	5	7	.0041	D
6215.9	123373	5	5	.0059	D
6248.4	122087	3	5	7.1 (-4)	D
6296.9	123373	3	5	.0094	D
6307.7	122087	5	5	.0063	D
6364.9	121794	3	1	.0058	D
6369.6	121933	5	3	.0044	D
6384.7	119760	3	3	.00439	C
6416.3	119683	3	5	.0121	C
6466.6	122514	1	3	.0016	D
6481.1	122479	1	3	9.8 (-4)	D
6538.1	120753	7	7	.0011	D
6604.0	120601	7	5	.0029	D
6660.7	121097	3	1	.0081	D
6664.1	120619	5	5	.0016	D

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
		Ar I			
6677.3	108723	3	1	.00241	C
6698.9	121161	5	3	.0017	D
6719.2	121933	1	3	.0025	D
6752.8	118907	3	5	.0201	C
6754.4	121933	3	3	.0022	D
6756.2	122087	5	5	.0038	D
6766.6	121012	5	3	.0042	D
6779.9	123468	1	3	.00126	C
6827.2	121933	5	3	.0025	D
6851.9	122087	3	5	7.0 (–4)	D
6871.3	118651	3	3	.0290	C
6879.6	120619	3	5	.0019	D
6887.1	120753	5	7	.0014	D
6888.2	120601	3	5	.0026	D
6925.0	121933	3	3	.0012	D
6937.7	118512	3	1	.0321	C
6951.5	120619	5	5	.0023	D
6960.3	120601	5	5	.0025	D
6965.4	107496	5	3	.067	C
6992.2	121794	3	1	.0078	D
7030.3	119683	7	5	.0278	C
7067.2	107290	5	5	.0395	C
7068.7	119760	5	3	.021	D
7086.7	121161	1	3	.0016	D
7107.5	119683	5	5	.0047	D
7125.8	121161	3	3	.0063	D
7147.0	107132	5	3	.0065	C
7158.8	121097	3	1	.022	D
7207.0	121161	5	3	.0258	C
7229.9	119445	5	5	6.9 (–4)	D
7265.2	119848	3	3	.0018	D
7270.7	119213	7	7	.0011	D
7272.9	107496	3	3	.0200	C
7285.4	121012	5	3	.0013	D
7311.7	119760	3	3	.018	D
7316.0	121161	3	3	.010	D
7350.8	121097	3	1	.012	D
7353.3	119213	5	7	.010	D
7372.1	119024	7	9	.020	D
7384.0	107290	3	5	.087	C
7393.0	119760	5	3	.0075	D
7412.3	120619	3	5	.0041	D
7422.3	120601	3	5	6.9 (–4)	D
7425.3	120753	5	7	.0032	D
7435.4	119683	5	5	.0094	D
7436.3	118907	7	5	.0028	D
7484.3	119445	3	5	.0035	D
7503.9	108723	3	1	.472	C
7510.4	120601	5	5	.0047	D
7514.7	107054	3	1	.430	C
7618.3	120619	3	5	.0030	D
7628.9	120601	3	5	.0030	D
7635.1	106238	5	5	.274	C
7670.0	118651	5	3	.0029	D
7704.8	119213	5	7	6.6 (–4)	D
7723.8	106087	5	3	.057	C
7724.2	107496	1	3	.127	C
7798.6	118907	3	5	9.1 (–4)	D
7868.2	119760	1	3	.00365	C
7891.1	118907	5	5	.0099	C
7916.4	119760	3	3	.0013	D
7948.2	107132	1	3	.196	C

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
		Ar II			
3000.4	192712	4	4	1.5	D
3028.9	192712	2	4	2.3	D
3093.4	192557	4	6	4.4	D
3139.0	186891	6	6	1.0	D
3161.4	192712	2	4	1.8	D
3169.7	186891	4	6	.82	D
3181.0	186470	6	4	.63	D
3236.8	190592	2	4	.52	D
3243.7	186171	4	2	2.0	D
3249.8	186470	2	4	1.0	D
3293.6	190592	4	4	1.7	D
3307.2	189935	2	2	3.4	D
3350.9	200235	6	6	1.5	D
3376.4	200139	8	8	1.5	D
3388.5	190592	2	4	1.9	D
3454.1	183986	6	4	.45	D
3464.1	187589	6	6	.37	D
3476.7	183797	6	6	1.34	C
3491.2	183986	4	4	2.2	D
3509.8	184192	2	2	2.5	D
3514.4	183797	4	6	1.23	C
3520.0	186074	6	6	.80	D
3521.3	185625	8	8	.23	D
3535.3	183986	2	4	.82	D
3545.6	187589	4	6	3.4	D
3545.8	198595	6	8	3.9	D
3548.5	186341	4	4	1.1	D
3559.5	186816	6	8	3.9	D
3565.0	186470	2	4	1.1	D
3576.6	185625	6	8	2.77	C
3581.6	186341	2	4	1.8	D
3582.4	186074	4	6	3.72	C
3588.4	185093	8	10	3.39	C
3600.2	199525	4	4	2.2	D
3622.1	182951	4	2	.64	D
3639.8	199680	4	6	1.4	D
3655.3	187589	4	6	.23	D
3671.0	199447	4	2	.71	D
3680.1	199982	2	4	1.2	D
3718.2	200235	4	6	2.0	D
3724.5	200235	6	6	.34	D
3729.3	161049	6	4	.60	D
3737.9	200139	6	8	2.3	D
3765.3	181594	6	6	.98	D
3770.5	182222	2	4	.41	D
3780.8	183676	8	8	.94	D
3796.6	199680	4	6	.25	D
3803.2	199680	6	6	1.5	D
3809.5	181594	4	6	.44	D
3825.7	199525	6	4	.76	D
3850.6	161049	4	4	.47	D
3868.5	186891	4	6	1.9	D
3925.7	195867	6	4	1.4	D
3928.6	161049	2	4	.30	D
3932.5	186470	4	4	1.1	D
3946.1	195865	8	6	1.4	D
3952.7	186341	4	4	.35	D
3979.4	186171	4	2	1.3	D
4033.8	182951	4	2	.98	D
4042.9	173348	4	4	1.4	D

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Ar II				
4072.0	173393	6	6	.57	C
4076.6	182951	2	2	.80	D
4076.9	183915	4	2	.99	D
4079.6	173348	6	4	.26	D
4131.7	172816	4	2	1.4	D
4156.1	182222	4	4	.39	D
4179.3	181594	6	6	.13	D
4218.7	183091	4	4	.36	D
4222.6	183915	4	2	.69	D
4227.0	195865	4	6	.41	D
4266.5	157673	6	6	.156	C
4275.2	183091	2	4	.26	D
4277.5	172214	6	4	1.0	D
4331.2	158168	4	4	.56	C
4337.1	195867	2	4	.34	D
4348.1	157234	6	8	1.24	C
4370.8	173348	4	4	.65	C
4371.3	155351	6	4	.233	C
4379.7	158428	2	2	1.04	C
4401.0	155043	8	6	.322	C
4426.0	157673	4	6	.83	C
4430.2	158168	2	4	.53	C
4448.9	195865	6	6	.65	D
4481.8	173393	6	6	.494	C
4545.1	160239	4	4	.413	B
4547.8	182222	4	4	.077	D
4589.9	170401	4	6	.82	C
4609.6	170530	6	8	.91	C
4637.2	170401	6	6	.090	D
4657.9	159707	4	2	.81	C
4726.9	159393	4	4	.50	C
4735.9	155351	6	4	.58	C
4764.9	160239	2	4	.575	B
4806.0	155043	6	6	.79	C
4847.8	155708	4	2	.85	C
4865.9	181594	4	6	.15	D
4879.9	158730	4	6	.78	C
4965.1	159393	2	4	.347	C
5009.3	155043	4	6	.147	C
5017.2	170401	4	6	.231	C
5062.0	155351	2	4	.221	C
5141.8	170530	6	8	.095	C
6638.2	158168	6	4	.129	C
6643.7	157234	10	8	.167	C
6684.3	157673	8	6	.113	C
	Ar III				
769.15	144023	5	3	6.0	D
871.10	114798	5	3	1.59	C
875.53	115328	3	1	3.74	C
878.73	113801	5	5	2.79	C
879.62	114798	3	3	.92	C
883.18	114798	1	3	1.22	C
887.40	113801	3	5	.90	C
3024.1	240292	5	7	2.6	D
3027.2	240258	5	5	.64	D
3054.8	240258	3	5	1.9	D
3064.8	240151	3	3	1.0	D
3078.2	240151	1	3	1.4	D
3285.9	204797	5	7	2.0	D
3301.9	204649	5	5	2.0	D
3311.3	204564	5	3	2.0	D
3336.1	226646	7	9	2.0	D
3344.7	226503	5	7	1.8	D
3352.1	226503	7	7	.22	D
3358.5	226356	3	5	1.6	D
3361.3	226356	5	5	.30	D
3472.6	225403	5	7	.20	D
3480.6	225403	7	7	1.6	D
3499.7	225155	3	3	1.3	D
3500.6	225148	3	5	.26	D
3502.7	225155	5	3	.43	D
3503.6	225148	5	5	1.2	D
3511.7	225148	7	5	.26	D
	Ar IV				
840.03	119044	4	2	2.73	C
843.77	118515	4	4	2.70	C
850.60	117564	4	6	2.63	C
	Ar VI				
292.15	342286	2	2	69.	C
294.05	342286	4	2	136.	C
	Ar VII				
250.41	514083	9	3*	278.	C
477.54	324151	9	15*	99.2	B
585.75	170720	1	3	78.3	B
637.30	271657	9	9*	67.	C
	Ar VIII				
158.92	629237	2	4	110.	C
159.18	628240	2	2	111.	C
229.44	575910	2	2	112.	C
230.88	575910	4	2	221.	C
337.09	629237	4	4	12.	D
337.26	629237	6	4	100.	C
338.22	628240	4	2	110.	C
519.43	332576	2	4	63.	C
526.46	332727	4	6	72.	C
526.87	332576	4	4	12.	D
700.24	142776	2	4	25.5	C
713.81	140058	2	2	24.	C
	Ar IX				
48.739	2051750	1	3	1690.	B
	Ar XIII				
162.96	698650	5	3	340.	C
163.08	628610	9	3*	530.	C
184.90	625840	5	5	166.	C
186.38	698650	1	3	88.	C
207.89	496450	9	9*	95.	C
245.10	423420	9	15*	37.	C
	Ar XIV				
180.29	554660	2	4	45.	C
183.41	545230	2	2	169.	C
187.95	554660	4	4	197.	C
191.35	545230	4	2	75.	C
194.39	514430	2	2	46.	C
203.35	514430	4	2	78.	C
	Ar XV				
25.05	3992000	1	3	1.7 (+4)	B
221.10	452280	1	3	95.5	B
265.3	621500	9	9*	81.	C

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Ar XVI				
23.52	4251000	2	6*	1.43(+4)	B
24.96	4281000	6	10*	4.4 (+4)	B
353.88	282580	2	4	15.	B
389.11	257000	2	2	11.	B
1268.	4254000	2	4	1.9	B
1401.	4246000	2	2	1.4	B
2975.	4280000	2	4	.090	C
3514.	4281000	4	6	.065	C
	Arsenic				
	As I				
1890.4	52898	4	6	2.0	D
1937.6	51610	4	4	2.0	D
1972.6	50694	4	2	2.0	D
2288.1	54605	6	4	2.8	D
2344.0	60835	2	4	.35	D
2349.8	53136	4	2	3.1	D
2369.7	60835	4	4	.60	D
2370.8	60815	4	6	.42	D
2456.5	51610	6	4	.072	D
2492.9	50694	4	2	.12	D
2745.0	54605	2	4	.26	D
2780.2	54605	4	4	.78	D
2860.4	53136	2	2	.55	D
2898.7	53136	4	2	.099	D
	Barium				
	Ba I				
2409.2	41494	1	3	8.6 (-4)	C
2414.1	41411	1	3	.0015	C
2420.1	41308	1	3	.0023	C
2427.4	41184	1	3	.0056	C
2432.5	41097	1	3	.0072	C
2438.8	40991	1	3	.0014	C
2444.6	40893	1	3	.0045	C
2452.4	40764	1	3	8.1 (-4)	C
2473.2	40421	1	3	.0046	C
2500.2	39985	1	3	.015	D
2543.2	39309	1	3	.041	D
2596.6	38500	1	3	.12	D
2646.5	37775	1	3	.011	D
2702.6	36990	1	3	.025	D
2739.2	36496	1	3	.0091	D
2785.3	35893	1	3	.028	D
3071.6	32547	1	3	.41	C
3501.1	28554	1	3	.19	D
3889.3	25704	1	3	.0088	D
3909.9	34603	3	5	.49	D
3935.7	34617	5	7	.47	D
3937.9	34603	5	5	.11	D
3993.4	34631	7	9	.55	D
3995.7	34617	7	7	.088	D
4132.4	24192	1	3	.0071	D
4239.6	37095	5	3	.24	D
4242.6	36200	3	5	.056	D
4264.4	35709	1	3	.15	D
4283.1	34736	5	7	.64	D
4323.0	35762	3	5	.15	D
4325.2	36629	5	7	.071	D
4332.9	35709	3	3	.15	D
4350.3	35617	3	5	.60	D
4402.5	35344	3	5	.70	D
4406.8	36200	5	5	.10	D
4431.9	34823	1	3	1.2	D
4467.1	35894	5	7	.066	D
4489.0	35785	5	7	.42	D
4493.6	35762	5	5	.36	D
4505.9	34823	3	3	1.1	D
4523.2	35617	5	5	.96	D
4573.9	34494	3	1	2.9	D
4579.6	35344	5	5	1.8	D
4591.8	30987	5	5	.016	D
4599.8	34371	3	1	1.0	D
4605.0	30744	3	1	.077	D
4619.9	33905	1	3	.093	D
4628.3	30816	5	3	.060	D
4673.6	30987	7	5	.065	D
4691.6	34823	5	3	1.6	D
4700.4	33905	3	3	.24	D
4726.4	32547	5	3	.46	D
5519.1	30751	3	5	.50	D
5535.5	18080	1	3	1.15	B
5777.6	30818	5	7	.64	D
5800.2	30751	5	5	.099	D
5805.7	26816	7	7	.011	D
5826.3	28554	5	3	.56	D
5907.6	25957	3	5	.036	D
5971.7	25957	5	5	.29	D
5997.1	25704	3	3	.27	D
6019.5	25642	3	1	1.4	D
6063.1	25704	5	3	.57	D
6110.8	25957	7	5	1.0	D
6341.7	24980	5	7	.19	D
6450.9	24532	3	5	.11	D
6482.9	26816	5	7	.44	D
6498.8	24980	7	7	.86	D
6527.3	24532	5	5	.59	D
6595.3	24192	3	3	.39	D
6675.3	24192	5	3	.19	D
6693.8	24532	7	5	.28	D
6865.7	25957	5	5	.078	D
7059.9	23757	7	9	.71	D
7120.3	23074	3	5	.21	D
7195.2	26160	1	3	.24	D
7280.3	22947	5	7	.53	D
7392.4	26160	3	3	.50	D
7417.5	23074	7	5	.025	D
7488.1	22947	7	7	.10	D
7672.1	22065	3	5	.31	D
7780.5	22065	5	5	.13	D
7905.8	26160	5	3	.63	D
7911.3	12637	1	3	.00298	C
	Ba II				
1413.4	76429	6	8	.017	D
1417.1	75438	4	6	.038	D
1444.9	74091	4	6	.081	D
1461.5	74109	6	8	.087	D
1487.0	72143	4	6	.14	D
1503.9	72170	6	8	.15	D
1554.4	69212	4	6	.26	D
1572.7	69260	6	8	.24	D
1573.9	69212	6	6	.016	D
1630.4	61336	2	2	.017	D

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Ba II				
1674.5	64596	4	6	.22	D
1694.4	64697	6	8	.21	D
1697.2	64596	6	6	.017	D
1761.8	61636	4	4	.0039	D
1771.0	61336	4	2	.034	D
1786.9	61636	6	4	.044	D
1892.7	73102	2	4	.090	D
1904.2	57391	4	6	.011	D
1906.8	72705	2	2	.051	D
1924.7	57632	6	8	.031	D
1954.2	73122	4	6	.13	D
1955.1	73102	4	4	.018	D
1970.2	72705	4	2	.067	D
1985.6	70620	2	4	.25	D
1999.5	50011	2	4	.10	D
2009.2	70015	2	2	.086	D
2052.7	70652	4	6	.20	D
2054.6	70620	4	4	.029	D
2080.0	70015	4	2	.10	D
2153.9	66674	2	4	.53	D
2200.9	65683	2	2	.20	D
2232.8	66725	4	6	.29	D
2235.4	66674	4	4	.044	D
2286.0	65683	4	2	.13	D
2528.5	59800	2	4	.71	D
2634.8	59895	4	6	.76	D
2641.4	59800	4	4	.12	D
2647.3	58025	2	2	.20	D
2771.4	58025	4	2	.40	D
3816.7	72143	4	6	.0023	D
3842.8	72170	6	8	.0022	D
3891.8	45949	2	4	1.67	B
4024.1	73102	6	4	.0053	D
4057.5	73122	8	6	.012	D
4130.7	46155	4	6	1.80	B
4166.0	45949	4	4	.37	D
4216.0	73102	2	4	.058	D
4287.8	72705	2	2	.024	D
4325.7	73122	4	6	.059	D
4329.6	73102	4	4	.0088	D
4405.2	72705	4	2	.039	D
4470.7	70620	6	4	.014	D
4509.6	70652	8	6	.012	D
4524.9	42355	2	2	.72	D
4554.0	21952	2	4	1.17	A
4708.9	70620	2	4	.097	D
4843.5	70652	4	6	.093	D
4847.1	70015	2	2	.041	D
4850.8	70620	4	4	.014	D
4900.0	42355	4	2	.775	B
4934.1	20262	2	2	.955	B
4997.8	70015	4	2	.061	D
5185.0	61636	2	4	.018	D
5361.4	64596	4	6	.048	D
5391.6	64697	6	8	.052	D
5413.6	66725	6	6	8.4 (-4)	D
5421.1	64596	6	6	.0019	D
5428.8	66674	6	4	.023	D
5480.3	66725	8	6	.018	D
5784.2	66674	2	4	.20	D
5853.7	21952	4	4	.048	B
5981.3	66725	4	6	.16	D
5999.9	66674	4	4	.026	D
6135.8	65683	2	2	.085	D
6141.7	21952	6	4	.37	B
6363.2	73102	6	4	.0029	D
6372.9	61636	4	4	6.7 (-4)	D
6378.9	65683	4	2	.099	D
6457.7	61636	6	4	.0030	D
6496.9	20262	4	2	.332	C
7556.8	70620	6	4	.0016	D
7678.2	70652	8	6	6.6 (-4)	D
8710.7	57632	6	8	.80	D
8737.7	57391	4	6	.93	D
	Beryllium				
	Be I				
1491.8	67035	1	3	.013	D
1661.5	60187	1	3	.20	D
2348.6	42565	1	3	5.56	B
2494.7	62054	9	15*	1.6	C
2650.6	59696	9	9*	4.31	C
4572.7	64428	3	5	.79	C
	Be II				
1197.1	115464	2	2	.47	D
1197.2	115464	4	2	.94	D
1512.3	98055	2	4	9.2	C
1512.4	98055	4	6	11.	C
1776.1	88232	2	2	1.4	C
1776.3	88232	4	2	2.9	C
2453.8	128972	2	6*	.142	C
3046.5	129310	2	4	.48	C
3046.7	129310	4	6	.59	C
3130.4	31935	2	4	1.14	B
3131.1	31929	2	2	1.15	B
3241.6	127335	2	2	.141	C
3241.8	127335	4	2	.28	C
3274.6	118761	2	4	.19	C
3274.7	118761	2	2	.19	C
4360.7	119421	2	4	.92	C
4361.0	119421	4	6	1.1	C
5255.9	134485	2	6*	.0256	C
5270.3	115464	2	2	.330	C
5270.8	115464	4	2	.66	C
6279.4	134681	2	4	.12	C
6279.7	134681	4	6	.143	C
6756.7	133556	2	2	.051	C
6757.1	133556	4	2	.102	C
7401.2	128972	2	4	.030	C
7401.4	128972	2	2	.030	C
	Bismuth				
	Bi I				
1954.5	51159	4	6	1.2	D
2021.2	49461	4	4	.060	D
2061.7	48490	4	6	.99	D
2110.3	47373	4	2	.91	D
2177.3	45916	4	2	.026	D
2228.3	44865	4	4	.89	D
2230.6	44817	4	6	2.6	D
2276.6	43913	4	4	.25	D
2515.7	51159	4	6	.043	D
2627.9	49461	4	4	.47	D

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Bi I				
2696.8	48490	4	6	.064	D
2780.5	47373	4	2	.309	C
2798.7	51159	6	6	.036	D
2898.0	45916	4	2	1.53	C
2938.3	49461	6	4	1.23	C
2989.0	44865	4	4	.55	C
2993.3	44817	4	6	.16	C
3024.6	48490	6	6	.88	C
3067.7	32588	4	2	2.07	C
3076.7	43913	4	4	.035	D
3397.2	44865	6	4	.181	C
3402.9	44817	6	6	.016	D
3510.9	43913	6	4	.068	D
3596.1	49461	2	4	.198	C
3888.2	47373	2	2	.069	D
4121.5	45916	2	2	.164	C
4308.5	44865	2	4	.016	D
4493.0	43913	2	4	.015	D
4722.5	32588	4	2	.117	C
6134.8	49461	4	4	.018	D
	Boron				
	B I				
1378.6	72535	2	4	3.50	C
1378.9	72523	2	2	14.0	C
1378.9	72535	4	4	17.5	C
1379.2	72523	4	2	7.0	C
1465.5	97000	2	4	3.34	C
1465.7	97000	4	4	6.7	C
1465.8	97000	6	4	10.0	C
1825.9	54767	2	4	2.0	C
1826.4	54767	4	6	2.4	C
2088.9	47857	2	4	.28	D
2089.6	47857	4	6	.33	D
2496.8	40040	2	2	.85	C
2497.7	40040	4	2	1.69	C
	Bromine				
	Br I				
1488.5	67184	4	4	1.2	D
1540.7	64907	4	4	1.4	D
1574.8	67184	2	4	.20	D
1576.4	63436	4	6	.021	D
1633.4	64907	2	4	.081	D
4365.1	89786	2	4	.0075	D
4425.1	87499	4	2	.0042	D
4441.7	85944	6	4	.0075	D
4472.6	87259	4	4	.0093	D
4477.7	85763	6	8	.013	D
4513.4	85586	6	4	.0028	D
4525.6	85527	6	6	.0072	D
4575.7	89032	4	4	.016	D
4614.6	88848	4	6	.0054	D
4979.8	87259	4	4	.0026	D
5245.1	85944	2	4	.0031	D
5345.4	85586	2	4	.0076	D
7348.5	78512	4	6	.12	D
7513.0	76743	6	4	.12	D
7803.0	79696	2	4	.053	D
7938.7	88483	6	6	.19	D
8131.5	79178	2	4	.038	D
8343.7	78866	2	2	.22	D
8446.6	76743	4	4	.12	D
8638.7	75009	6	4	.097	D
	Br II				
4704.9	115176	5	7	1.1	D
4785.5	114818	5	5	.94	D
4816.7	114683	5	3	1.1	D
	Cadmium				
	Cd I				
2288.0	43692	1	3	5.3	C
2836.9	65354	1	3	.28	D
2880.8	65359	3	5	.42	D
2881.2	65353	3	3	.24	D
2980.6	65367	5	7	.59	D
2981.4	65359	5	5	.15	D
3261.1	30656	1	3	.00406	C
3403.7	59486	1	3	.77	C
3466.2	59498	3	5	1.2	D
3467.7	59486	3	3	.67	D
3610.5	59516	5	7	1.3	D
3612.9	59498	5	5	.35	D
4140.5	67838	3	5	.047	D
4662.4	65135	3	5	.055	C
4678.1	51484	1	3	.13	C
4799.9	51484	3	3	.41	C
5085.8	51484	5	3	.56	C
6438.5	59220	3	5	.59	C
	Cd II				
2144.4	46619	2	4	2.8	C
2265.0	44136	2	2	3.0	C
2572.9	82991	2	2	1.7	C
2748.5	82991	4	2	2.8	C
4415.6	69259	4	6	.014	B
	Calcium				
	Ca I				
2275.5	43933	1	3	.301	C
2995.0	48538	1	3	.367	C
2997.3	48564	3	5	.241	C
2999.6	48538	3	3	.279	C
3000.9	48524	3	1	1.58	C
3006.9	48564	5	5	.75	C
3009.2	48538	5	3	.430	C
3344.5	45049	1	3	.151	C
3350.2	45050	3	5	.178	C
3361.9	45052	5	7	.223	C
3624.1	42743	1	3	.212	C
3630.8	42745	3	5	.297	C
3631.0	42743	3	3	.153	C
3644.4	42747	5	7	.355	C
3644.8	42745	5	5	.094	C
3870.5	46165	3	5	.072	D
3957.1	40474	3	3	.098	C
3973.7	40474	5	3	.175	C
4092.6	44763	3	5	.11	D
4094.9	44763	5	7	.12	D
4098.5	44763	7	9	.13	D
4108.5	46182	5	7	.90	D
4226.7	23652	1	3	2.18	B
4283.0	38552	3	5	.434	C
4289.4	38465	1	3	.60	C

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Ca I				
4299.0	38465	3	3	.466	C
4302.5	38552	5	5	1.36	C
4307.7	38418	3	1	1.99	C
4318.7	38465	5	3	.74	C
4355.1	44805	5	7	.19	D
4425.4	37748	1	3	.498	C
4435.0	37752	3	5	.67	C
4435.7	37748	3	3	.342	C
4454.8	37757	5	7	.87	C
4455.9	37752	5	5	.20	C
4526.9	43933	5	3	.41	D
4578.6	42170	3	5	.176	C
4581.4	42171	5	7	.209	C
4585.9	42171	7	9	.229	C
4685.3	44990	3	5	.080	D
4878.1	42344	5	7	.188	C
5041.6	41679	5	3	.33	D
5188.9	42919	3	5	.40	D
5261.7	39335	3	3	.15	D
5262.2	39333	3	1	.60	D
5264.2	39340	5	5	.091	D
5265.6	39335	5	3	.44	D
5270.3	39340	7	5	.50	D
5582.0	38259	5	7	.060	D
5588.8	38259	7	7	.49	D
5590.1	38219	3	5	.083	D
5594.5	38219	5	5	.38	D
5598.5	38192	3	3	.43	D
5601.3	38219	7	5	.086	D
5602.9	38192	5	3	.14	D
5857.5	40720	3	5	.66	D
6102.7	31539	1	3	.096	C
6122.2	31539	3	3	.287	C
6161.3	36575	5	5	.033	D
6162.2	31539	5	3	.477	C
6163.8	36555	3	3	.056	D
6166.4	36548	3	1	.22	D
6169.1	36555	5	3	.17	D
6169.6	36575	7	5	.19	D
6439.1	35897	7	9	.53	D
6449.8	35835	3	5	.090	D
6462.6	35819	5	7	.47	D
6471.7	35819	7	7	.059	D
6493.8	35730	3	5	.44	D
6499.7	35730	5	5	.081	D
	Ca II				
1341.9	74522	2	4	.015	D
1342.5	74485	2	2	.015	D
1649.9	60611	2	4	.0032	D
1652.0	60533	2	2	.0031	D
1673.9	84934	2	4	.224	C
1680.1	84936	4	6	.265	C
1680.1	84934	4	4	.0441	C
1807.3	80522	2	4	.354	C
1814.5	80526	4	6	.42	C
1814.7	80522	4	4	.070	C
1843.1	79448	2	2	.16	C
1850.7	79448	4	2	.308	C
2103.2	72722	2	4	.82	C
2112.8	72731	4	6	.97	C
2113.2	72722	4	4	.16	C

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Ca II				
2197.8	70678	2	2	.31	C
2208.6	70678	4	2	.62	C
3158.9	56839	2	4	3.1	C
3179.3	56858	4	6	3.6	C
3181.3	56839	4	4	.58	C
3706.0	52167	2	2	.88	C
3736.9	52167	4	2	1.7	C
3933.7	25414	2	4	1.47	C
3968.5	25192	2	2	1.4	C
	Ca III				
357.97	279354	1	3	880.	D
439.69	227432	1	3	.19	D
490.55	203852	1	3	.016	D
	Ca V				
558.60	197845	5	3	22.	D
637.93	156760	5	3	3.9	D
643.12	157901	3	1	9.1	D
646.57	154671	5	5	6.9	D
647.88	156760	3	3	2.3	D
651.55	156760	1	3	2.9	D
656.76	154671	3	5	2.1	D
	Ca VII				
550.20	203616	5	5	18.	D
624.39	160158	1	3	3.3	D
630.54	160220	3	5	4.5	D
630.79	160158	3	3	2.2	D
639.15	160529	5	7	5.7	D
640.41	160220	5	5	1.3	D
	Ca VIII				
182.71	547322	2	2	160.	C
184.16	547322	4	2	320.	C
	Ca IX				
163.23	758974	5	3	376.	C
371.89	410514	1	3	88.	C
373.81	410627	3	5	116.	C
378.08	410841	5	7	150.	C
395.03	467631	3	5	220.	D
466.24	214482	1	3	112.	B
498.01	343908	3	5	24.9	C
506.18	343908	5	5	72.	C
515.57	340308	5	3	37.5	C
	Ca X				
110.96	901200	2	4	290.	C
111.20	899290	2	2	292.	C
151.84	832790	2	2	230.	C
153.02	832790	4	2	450.	C
206.57	901200	4	4	29.	D
206.75	901200	6	4	260.	C
207.39	899290	4	2	280.	C
411.70	417112	2	4	83.	C
419.75	417522	4	6	95.	C
420.47	417112	4	4	16.	D
557.76	179287	2	4	35.0	C
574.01	174213	2	2	32.	C
	Ca XI				
30.448	3284300	1	3	6200.	D
30.867	3239700	1	3	4.9 (+4)	D
35.212	2839940	1	3	2000.	D

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Ca XII				
140.05	709000	4	2	370.	C
147.27	709000	2	2	160.	C
	Ca XV				
141.69	814370	5	3	408.	C
142.23	728910	9	3*	630.	C
161.00	729720	5	5	190.	C
	Ca XVII				
19.558	5113000	1	3	3.8 (+4)	C
21.198	5236000	3	5	4.9 (+4)	C
192.82	518620	1	3	121.	C
218.82	726450	3	5	27.6	C
223.02	706680	1	3	34.4	C
228.72	706680	3	3	23.7	C
232.83	726450	5	5	65.	C
244.06	706680	5	3	32.8	C
	Ca XVIII				
18.71	5346000	2	6*	2.31(+4)	B
19.74	5383000	6	10*	7.0 (+4)	B
302.19	330920	2	4	20.	B
344.76	290060	2	2	13.	B
	Carbon				
	C I				
945.19	105799	1	3	6.2	D
945.34	105799	3	3	18.	D
945.58	105799	5	3	31.	D
1260.7	79319	1	3	.40	D
1260.9	79323	3	1	1.2	D
1261.0	79319	3	3	.31	D
1261.1	79311	3	5	.30	D
1261.4	79319	5	3	.50	D
1261.6	79311	5	5	.93	D
1274.1	78530	5	7	.0068	D
1277.2	78293	1	3	.88	D
1277.3	78308	3	5	1.2	D
1277.5	78293	3	3	.65	D
1277.6	78318	5	7	1.5	D
1277.7	78308	5	5	.39	D
1278.0	78293	5	3	.042	D
1279.2	78216	5	7	.11	D
1279.9	78148	3	5	.21	D
1280.1	78117	1	3	.27	D
1280.3	78148	5	5	.62	D
1280.4	78117	3	3	.20	D
1280.6	78105	3	1	.81	D
1280.8	78117	5	3	.35	D
1328.8	75254	1	3	.49	D
1364.2	83498	5	5	.047	D
1431.6	103587	5	7	1.5	D
1432.1	103563	5	5	1.4	D
1432.5	103542	5	3	1.3	D
1459.0	78731	5	3	.37	D
1463.3	78530	5	7	2.1	D
1467.4	78340	5	3	.46	D
1468.4	78293	5	3	.019	D
1470.1	78216	5	7	.0088	D
1472.2	78117	5	3	.0051	D
1481.8	77680	5	5	.33	D
1560.3	64090	1	3	.82	D
1561.3	64091	5	5	.36	D
1561.4	64087	5	7	1.4	D
1656.3	60393	3	5	.80	D
1656.9	60353	1	3	1.1	D
1657.0	60393	5	5	2.4	D
1657.4	60353	3	3	.80	D
1657.9	60333	3	1	3.2	D
1658.1	60353	5	3	1.3	D
1751.8	78731	1	3	.57	D
1763.9	78340	1	3	.022	D
1765.4	78293	1	3	.0071	D
1930.9	61982	5	3	3.7	D
2478.6	61982	1	3	.18	D
2902.3	105799	1	3	.0066	D
2903.3	105799	3	3	.017	D
2905.0	105799	5	3	.022	D
4269.0	85400	3	5	.0032	D
4371.4	84852	3	3	.0097	D
4762.3	81326	1	3	.0052	D
4762.5	81344	3	5	.0038	D
4766.7	81326	3	3	.0039	D
4770.0	81311	3	1	.015	D
4771.8	81344	5	5	.012	D
4775.9	81326	5	3	.0062	D
4812.9	81105	1	3	9.7 (−4)	D
4817.4	81105	3	3	.0028	D
4826.8	81105	5	3	.0047	D
4932.1	82252	3	1	.046	D
5052.2	81770	3	5	.017	D
5380.3	80563	3	3	.016	D
5793.1	81344	7	5	.0033	D
5794.5	81344	5	5	5.8 (−4)	D
5800.2	81326	3	3	9.7 (−4)	D
5800.6	81326	5	3	.0029	D
5805.2	81311	3	1	.0039	D
6587.6	84032	3	3	.024	D
	C II				
687.35	145551	4	6	27.0	C
858.09	116538	2	2	.369	C
858.56	116538	4	2	1.11	C
903.62	110666	2	4	6.6	C
903.96	110624	2	2	26.3	C
904.14	110666	4	4	33.0	C
904.48	110624	4	2	13.3	C
1009.9	142027	2	4	5.8	C
1010.1	142027	4	4	11.5	C
1010.4	142027	6	4	17.3	C
1036.3	96494	2	2	8.0	C
1037.0	96494	4	2	15.9	C
1323.9	150467	4	4	4.53	C
1324.0	150462	6	6	4.71	C
1334.5	74933	2	4	2.41	C
1335.7	74930	4	6	2.89	C
2509.1	150467	2	4	.54	C
2511.7	150467	4	4	.106	C
2512.1	150462	4	6	.64	C
6578.1	131736	2	4	.36	C
6582.9	131724	2	2	.36	C
7231.3	145549	2	4	.36	C
7236.4	145551	4	6	.44	C
7237.2	145549	4	4	.072	C

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	C III				
310.17	322404	1	3	18.	C
386.20	258931	1	3	32.2	B
459.46	270011	1	3	55.	C
459.52	270012	3	5	75.	C
459.63	270015	5	7	98.	C
574.28	276483	3	5	63.	C
977.03	102352	1	3	17.5	B
1174.9	137502	3	5	3.42	C
1175.3	137454	1	3	4.55	C
1175.6	137454	3	3	3.41	C
1175.7	137502	5	5	10.2	C
1176.0	137426	3	1	13.6	C
1176.4	137454	5	3	5.7	C
1247.4	182520	3	1	18.6	C
2296.9	145876	3	5	1.46	C
4647.4	259724	3	5	.73	C
4650.3	259711	3	3	.74	C
4651.5	259706	3	1	.74	C
	C IV				
312.43	320071	2	6*	44.9	B
384.13	324886	6	10*	180.	C
1548.2	64592	2	4	2.66	B
1550.8	64484	2	2	2.64	B
5801.3	320082	2	4	.319	B
5812.0	320050	2	2	.316	B
	C V				
34.973	2859375	1	3	2554.	AA
40.268	2483371	1	3	8873.	AA
227.19	2851418	3	9*	136.3	AA
247.31	2859375	1	3	127.9	AA
248.70	2857310	9	15*	425.	A
260.19	2839562	9	3*	66.83	AA
267.27	2857529	3	5	396.	A
2273.9	2455225	3	9*	.5650	AA
3526.7	2483371	1	3	.1663	AA
8432.2	2851418	3	9*	.06870	AA
	Cesium				
	Cs I				
3203.5	31207	2	4	7.6 (-6)	C
3205.3	31189	2	4	7.9 (-6)	C
3207.5	31168	2	4	8.5 (-6)	C
3210.0	31144	2	4	9.4 (-6)	C
3212.8	31116	2	4	1.19(-5)	C
3216.2	31084	2	4	1.49(-5)	C
3220.1	31046	2	4	1.7 (-5)	C
3220.2	31045	2	2	1.07(-7)	C
3224.8	31001	2	4	2.0 (-5)	C
3225.0	30999	2	2	1.43(-7)	C
3230.5	30946	2	4	2.5 (-5)	C
3230.7	30944	2	2	1.97(-7)	C
3237.4	30880	2	4	2.8 (-5)	C
3237.6	30878	2	2	2.63(-7)	C
3245.9	30799	2	4	3.45(-5)	C
3246.2	30796	2	2	3.7 (-7)	C
3256.7	30698	2	4	4.25(-5)	C
3257.1	30694	2	2	7.0 (-7)	C
3270.5	30568	2	4	5.6 (-5)	C
3271.0	30563	2	2	9.8 (-7)	C
	Cs I				
3288.6	30399	2	4	1.0 (-4)	C
3289.3	30393	2	2	2.7 (-6)	C
3313.1	30175	2	4	1.6 (-4)	C
3314.0	30166	2	2	5.2 (-6)	C
3347.5	29865	2	4	2.2 (-4)	C
3348.8	29853	2	2	1.1 (-5)	C
3397.9	29421	2	4	4.0 (-4)	C
3400.0	29404	2	2	2.4 (-5)	C
3476.8	28754	2	4	6.6 (-4)	C
3480.0	28727	2	2	6.6 (-5)	C
3611.4	27682	2	4	.0015	C
3617.3	27637	2	2	2.5 (-4)	C
3876.1	25792	2	4	.0038	C
3888.6	25709	2	2	9.7 (-4)	C
4555.3	21946	2	4	.0188	C
4593.2	21765	2	2	.0080	C
	Chlorine				
	Cl I				
1188.8	84120	4	6	2.33	C
1188.8	84122	4	4	.271	C
1201.4	84122	2	4	2.39	C
1335.7	74866	4	2	1.74	C
1347.2	74226	4	4	4.19	C
1351.7	74866	2	2	3.23	C
1363.4	74226	2	4	.75	C
4323.3	95612	4	4	.011	D
4363.3	95401	4	6	.0068	D
4379.9	95313	4	4	.014	D
4389.8	94732	6	8	.014	D
4526.2	96313	4	4	.051	C
4601.0	96594	2	2	.042	C
4661.2	96313	2	4	.012	D
7256.6	85735	6	4	.15	D
7414.1	85442	6	4	.047	D
7547.1	85735	4	4	.12	D
7717.6	85442	4	4	.030	D
7745.0	85735	2	4	.063	D
7769.2	95787	6	6	.060	D
7821.4	95701	6	8	.098	D
7830.8	95898	4	4	.097	D
7878.2	84648	6	6	.018	D
7899.3	95787	4	6	.051	D
7924.6	85442	2	4	.021	D
7935.0	96731	6	8	.039	D
7997.9	84988	4	4	.021	D
	Cl II				
3329.1	161798	5	7	1.5	D
3522.1	174855	7	7	1.4	D
3798.8	172652	5	7	1.6	D
3805.2	172743	7	9	1.8	D
3809.5	172575	3	5	1.5	D
3851.0	154624	5	7	1.8	D
3851.4	154621	5	5	1.6	D
3854.7	184660	3	5	2.2	D
3861.9	184657	5	7	2.4	D
3868.6	184630	7	9	2.7	D
3913.9	172743	9	9	.82	D
3990.2	174855	5	7	.84	D
4132.5	153259	5	5	1.6	D
4276.5	170577	9	7	.76	D

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Cl II				
4768.7	158771	3	5	.77	D
4781.3	158788	5	7	1.0	D
4794.6	128731	5	7	1.04	C
4810.1	128644	5	5	.99	C
4819.5	128623	5	3	1.00	C
4904.8	147128	5	7	.81	D
4917.7	147056	3	5	.75	D
5078.3	146471	7	7	.77	D
5219.1	131765	3	9*	.86	C
5392.1	147607	5	7	1.0	D
	Cl III				
2298.5	248528	4	4	4.2	D
2340.6	248658	6	6	4.2	D
2370.4	258886	8	6	2.8	D
2531.8	248528	2	4	4.4	D
2532.5	248658	4	6	5.3	D
2577.1	243828	4	6	4.3	D
2580.7	244685	6	8	4.7	D
2601.2	239506	2	4	4.6	D
2603.6	239730	4	6	5.0	D
2609.5	240075	6	8	5.7	D
2617.0	240568	8	10	6.6	D
2661.6	241685	4	6	3.4	D
2665.5	242046	6	8	4.8	D
2691.5	243081	4	4	3.5	D
2710.4	242823	4	6	3.5	D
3340.4	204541	6	6	1.5	D
3392.9	217913	4	4	1.9	D
3393.5	217850	6	6	1.9	D
3530.0	216710	6	8	1.8	D
3560.7	216525	4	6	1.7	D
3602.1	202368	6	8	1.7	D
3612.9	201765	4	6	1.2	D
3720.5	205947	4	6	1.7	D
	Chromium				
	Cr I				
2000.0	58293	9	9	1.4	D
2383.3	50253	9	11	.41	D
2385.7	50211	9	9	.17	D
2389.2	49653	3	5	.23	D
2408.6	49812	9	7	.67	D
2408.7	49598	7	5	.29	D
2492.6	47918	3	5	.45	C
2496.3	47975	5	7	.56	C
2502.5	48043	7	9	.22	D
2504.3	48014	7	9	.45	C
2549.5	47022	3	3	.48	D
2560.7	46968	5	5	.43	D
2577.7	46879	7	7	.26	D
2591.9	46879	9	7	.65	C
2622.9	46422	9	9	.13	D
2702.0	45306	9	11	.21	C
2726.5	44259	5	7	.75	C
2731.9	44187	5	5	.78	C
2736.5	44126	5	3	.75	D
2752.9	44126	3	3	.87	D
2757.1	44187	5	5	.68	C
2761.8	44126	5	3	.68	D
2764.4	44259	7	7	.37	D
2769.9	44187	7	5	1.1	C
2780.7	44259	9	7	1.4	C
2871.6	42909	7	9	.12	D
2879.3	42648	5	7	.21	D
2887.0	42439	3	5	.27	D
2889.3	42909	9	9	.66	C
2899.2	42293	3	3	.15	D
2909.1	42293	5	3	.68	C
2967.6	41782	7	9	.39	D
2971.1	41575	5	7	.71	C
2975.5	41409	3	5	.89	C
2980.8	41289	1	3	.85	D
2988.7	41043	5	7	.52	C
2991.9	41225	3	1	3.0	D
2995.1	40971	5	5	.43	D
2996.6	41289	5	3	2.0	C
2998.8	40930	5	3	.59	D
3000.9	41409	7	5	1.6	C
3005.1	41575	9	7	.92	C
3013.7	40983	3	5	.83	C
3020.7	40906	3	3	1.5	D
3021.6	41393	9	11	3.2	C
3024.4	40983	5	5	2.3	C
3030.2	41086	7	7	1.1	C
3034.2	41043	7	7	.35	D
3037.0	41225	9	9	.54	C
3040.9	40971	7	5	.74	D
3053.9	41043	9	7	1.2	C
3148.4	55686	9	11	.59	C
3155.2	55741	11	13	.54	C
3163.8	55799	13	15	.52	C
3237.7	54811	9	9	1.3	D
3238.1	54930	11	11	.20	D
3578.7	27935	7	9	1.48	B
3593.5	27820	7	7	1.50	B
3605.3	27729	7	5	1.62	B
3639.8	47986	13	11	1.8	D
3768.7	47047	7	5	.22	D
3804.8	50558	9	9	.69	D
3879.2	50058	3	5	.56	D
3963.7	45741	13	15	1.3	D
3969.8	45707	11	13	1.2	D
3981.2	46968	3	5	.11	D
3983.9	45615	7	9	1.05	C
4001.4	56362	9	11	.65	D
4030.7	56155	3	5	.79	D
4039.1	55799	15	15	.68	C
4048.8	55741	13	13	.65	D
4058.8	55686	11	11	.69	D
4161.4	59957	13	15	.80	D
4165.5	59884	11	13	.75	D
4211.4	48043	7	9	.085	D
4224.5	48562	9	9	.067	D
4239.0	47866	9	9	.071	D
4254.4	23499	7	9	.315	B
4274.8	23386	7	7	.306	B
4280.4	54405	13	15	.47	D
4289.7	23305	7	5	.313	B
4297.7	54317	11	13	.49	D
4344.5	31106	7	9	.11	C
4351.8	31280	9	11	.12	C
4374.2	47055	13	11	.10	C
4375.3	46905	11	9	.072	D

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Cr I				
4381.1	44667	5	3	.10	D
4387.5	46986	13	11	.066	D
4413.9	51287	7	5	.41	D
4432.2	45719	1	3	.17	D
4458.5	46705	9	11	.13	D
4482.9	49477	3	3	.30	D
4488.1	56210	7	7	.63	D
4506.9	55945	13	11	.27	D
4511.9	47055	9	9	.13	D
4526.5	42606	13	13	.20	D
4530.7	42589	11	11	.20	D
4544.6	42515	5	5	.26	D
4595.6	55517	13	13	.47	D
4632.2	46688	7	7	.071	D
4639.5	46637	5	7	.095	D
4646.2	29825	9	7	.087	C
4689.4	46525	7	5	.23	D
4708.0	46783	11	9	.37	D
4718.4	46959	13	11	.42	D
4723.1	46000	7	7	.093	D
4724.4	46058	9	9	.063	D
4727.2	45349	13	13	.051	D
4729.7	46077	5	3	.17	D
4730.7	45966	7	5	.28	D
4737.4	46000	9	7	.24	D
4789.3	41393	13	11	.076	D
4792.5	45966	7	5	.26	D
4801.0	46000	9	7	.23	D
4870.8	45359	7	9	.35	D
4887.0	45354	9	11	.32	D
4922.3	45349	11	13	.40	D
4936.3	45359	7	9	.14	D
4954.8	45354	9	11	.12	D
5139.7	47048	7	7	.13	D
5177.4	46959	9	11	.061	D
5184.6	46783	7	9	.11	D
5192.0	46637	5	7	.14	D
5196.6	47055	11	9	.12	D
5200.2	46525	3	5	.16	D
5204.5	26802	5	3	.55	D
5206.0	26796	5	5	.53	D
5208.4	26788	5	7	.51	D
5243.4	46449	5	3	.20	D
5261.8	48825	7	9	.13	D
5272.0	46783	7	9	.11	D
5287.2	46637	5	7	.078	D
5304.2	46783	9	9	.066	D
5312.9	46637	7	7	.11	D
5318.8	46525	5	5	.13	D
5328.3	42261	9	11	.60	D
5340.4	46449	5	3	.16	D
5400.6	45734	5	5	.16	D
5409.8	26788	9	7	.062	D
	Cr II				
2653.6	49706	4	6	.35	D
2658.6	49565	2	4	.58	D
2666.0	49646	6	8	.59	D
2668.7	49493	4	2	1.4	D
2671.8	49565	6	4	1.0	D
2672.8	49706	8	6	.55	D
2693.5	67334	10	8	1.4	D
2727.3	67876	10	8	1.7	D
2740.1	48632	6	8	.11	D
2745.0	66727	4	6	.85	D
2768.6	74424	6	8	2.8	D
2774.4	75717	8	8	1.7	D
2778.1	75810	10	10	3.2	D
2782.4	69348	6	4	1.6	D
2785.7	69506	10	8	2.1	D
2787.6	66727	6	6	1.5	D
2792.2	69498	12	10	2.3	D
2800.8	69388	12	14	2.2	D
2818.4	68993	8	10	2.2	D
2822.0	68844	6	8	2.3	D
2832.5	70108	12	10	1.3	D
2838.8	73486	8	8	2.7	D
2840.0	65420	10	12	2.7	D
2843.3	47465	8	10	.64	D
2849.8	47228	6	8	.92	D
2851.4	65218	8	10	2.2	D
2856.8	54626	4	6	.43	D
2857.4	54785	6	8	.28	D
2860.9	46906	2	4	.69	D
2862.6	47228	8	8	.63	D
2866.7	46906	4	4	1.2	D
2867.1	54500	4	4	1.1	D
2867.7	46824	2	2	1.1	D
2870.4	54626	6	6	1.3	D
2873.8	54418	4	2	.88	D
2878.5	47228	10	8	.074	D
2880.9	54500	6	4	.79	D
2888.7	70880	10	12	.88	D
2898.5	65710	10	12	1.2	D
2921.8	65384	8	10	.90	D
2927.1	72717	10	10	2.8	D
2930.9	64062	2	4	1.1	D
2935.1	64924	6	8	1.8	D
2953.4	63802	2	2	1.8	D
2953.7	68477	10	10	.92	D
2966.1	64924	10	8	.54	D
2971.9	64031	14	14	2.0	D
2979.7	63849	12	12	1.8	D
2985.3	63707	10	10	2.2	D
2989.2	63601	8	8	2.2	D
3040.9	67506	10	12	4.8	D
3041.7	68477	10	10	3.1	D
3050.1	67589	12	14	1.8	D
3093.5	70880	10	12	.67	D
3096.1	70852	10	8	.75	D
3107.6	70679	8	10	.62	D
3118.7	51584	2	4	1.7	D
3120.4	51670	4	6	1.5	D
3122.6	65710	12	12	.44	D
3128.7	51584	4	4	.81	D
3136.7	51670	6	6	.64	D
3152.2	67070	4	4	1.8	D
3180.7	51943	12	10	.70	D
3183.3	67012	8	6	.87	D
3209.2	51670	8	6	.68	D
3217.4	51584	6	4	.77	D
3234.1	65543	10	8	.92	D
3238.8	65680	12	10	.54	D
3295.4	64031	12	14	.32	D

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Cr II				
3336.3	49493	2	2	.42	D
3339.8	49565	4	4	.49	D
3342.6	49706	6	6	.39	D
3347.8	49493	4	2	.52	D
3358.5	49565	6	4	1.1	D
3360.3	54785	8	8	1.3	D
3368.1	49706	8	6	1.4	D
3378.3	54626	8	6	.41	D
3379.4	54626	4	6	.48	D
3382.7	49352	6	6	.45	D
3391.4	49006	2	4	.19	D
3393.0	54500	2	4	.46	D
3393.8	54500	4	4	.66	D
3394.3	54500	6	4	.75	D
3402.4	54418	2	2	.80	D
3408.8	49352	8	6	.95	D
3421.2	48750	2	2	1.7	D
3422.7	49006	6	4	1.4	D
3433.3	48750	4	2	1.3	D
3511.8	48491	8	6	.079	D
4242.4	54785	10	8	.12	D
	Cr XXI				
149.90	667110	1	3	160.	C
	Cr XXII				
8.51	11800000	2	6*	1.2 (+4)	C
9.493	10534000	2	6*	2.5 (+4)	C
9.809	10553000	2	4	4.1 (+4)	B
9.865	10590000	4	6	4.9 (+4)	B
12.620	7924000	2	4	5.13(+4)	B
12.662	7898000	2	2	5.28(+4)	B
13.147	7964000	2	4	1.3 (+5)	B
13.294	7966000	4	6	1.6 (+5)	B
13.306	7964000	4	4	2.6 (+4)	C
25.2	11800000	2	6*	3750.	C
36.93	10534000	2	6*	7000.	C
37.52	10580000	6	10*	1.7 (+4)	B
223.00	448430	2	4	33.	B
279.69	357540	2	2	17.	B
	Cr XXIII				
2.182	45830000	1	3	3.3 (+6)	B
	Cobalt				
	Co I				
2987.2	33467	10	8	.050	C
2989.6	33440	10	10	.037	C
3013.6	33173	10	8	.016	C
3017.5	33946	8	6	.072	C
3042.5	33674	8	6	.020	C
3044.0	32842	10	10	.19	C
3048.9	34196	6	4	.078	C
3061.8	33467	8	8	.15	C
3064.4	33440	8	10	.0068	C
3082.6	32431	10	12	.026	C
3086.8	34196	4	4	.19	C
3089.6	33173	8	8	.024	C
3098.2	33674	6	6	.027	C
3139.9	32655	8	6	.028	C
3147.1	33173	6	8	.045	C
3149.3	33151	6	4	.031	C
3395.4	34134	6	8	.26	C
3405.1	32842	10	10	.98	C
3409.2	33467	8	8	.42	C
3412.3	33440	8	10	.64	C
3412.6	29295	10	8	.12	C
3417.2	33946	6	6	.32	C
3431.6	29949	8	6	.11	C
3433.0	34196	4	4	1.1	C
3442.9	30444	6	4	.12	C
3443.6	33173	8	8	.63	C
3449.2	33674	6	6	.73	C
3449.4	32465	10	10	.16	C
3455.2	30743	4	2	.18	C
3462.8	33946	4	6	.87	C
3465.8	28845	10	12	.097	C
3483.4	32842	8	10	.062	C
3489.4	36092	8	6	1.6	C
3491.3	30444	4	4	.053	C
3495.7	33674	4	6	.45	C
3496.7	32733	8	8	.036	C
3518.4	36875	6	4	1.7	C
3520.1	29216	8	6	.034	C
3521.6	31871	10	8	.12	C
3523.4	33449	4	2	1.2	C
3526.9	28346	10	10	.12	C
3529.0	29735	6	8	.090	C
3529.8	32465	8	10	.48	C
3533.4	30103	4	6	.091	C
3550.6	29563	6	4	.042	C
3560.9	33151	4	4	.24	C
3564.9	32733	6	8	.086	C
3569.4	35451	8	8	1.6	C
3575.0	32655	6	6	.18	C
3575.4	28777	8	8	.094	C
3585.2	32028	8	8	.076	C
3587.2	36330	6	6	1.9	C
3594.9	29216	6	6	.086	C
3602.1	29563	4	4	.10	C
3605.4	31871	8	8	.039	C
3627.8	31700	8	10	.052	C
3631.4	28346	8	10	.0065	C
3647.7	29216	4	6	.012	C
3652.5	28777	6	8	.0095	C
3704.1	35451	6	8	.18	C
3745.5	34134	8	8	.077	C
3842.1	33463	8	6	.31	C
3845.5	33440	8	10	.49	C
3873.1	29295	10	8	.12	C
3874.0	29949	8	6	.12	C
3881.9	30444	6	4	.11	C
3894.1	34134	6	8	.81	C
3895.0	30743	4	2	.11	C
3909.9	25569	10	12	.0019	C
3936.0	32842	8	10	.15	C
3995.3	32465	8	10	.36	C
3997.9	33467	6	8	.079	C
4020.9	28346	10	10	.0092	D
4092.4	31871	8	8	.14	D
4118.8	32733	6	8	.34	C
4121.3	31700	8	10	.24	C

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
Copper					
Cu I					
2024.3	49383	2	6*	.098	C
2165.1	46173	2	4	.51	B
2178.9	45879	2	4	.913	B
2181.7	45821	2	2	1.0	C
2225.7	44916	2	2	.46	C
2244.3	44544	2	4	.0119	B
2441.6	40944	2	2	.020	C
2492.2	40114	2	4	.0311	B
2618.4	49383	6	4	.307	C
2766.4	49383	4	4	.096	C
2824.4	46598	6	6	.078	C
2961.2	44963	6	8	.0376	C
3063.4	45879	4	4	.0155	C
3194.1	44544	4	4	.0155	C
3247.5	30784	2	4	1.39	B
3274.0	30535	2	2	1.37	B
3337.8	41153	6	8	.0038	C
4022.6	55388	2	4	.190	C
4062.6	55391	4	6	.210	C
4249.0	64472	2	2	.195	C
4275.1	62403	6	8	.345	C
4480.4	52849	2	2	.030	C
4509.4	64472	4	2	.275	C
4530.8	52849	4	2	.084	C
4539.7	63585	6	4	.212	C
4587.0	62948	8	6	.320	C
4651.1	62403	10	8	.380	C
4704.6	62403	8	8	.055	C
5105.5	30784	6	4	.020	C
5153.2	49935	2	4	.60	C
5218.2	49942	4	6	.75	C
5220.1	49935	4	4	.150	C
5292.5	62403	8	8	.109	C
5700.2	30784	4	4	.0024	C
5782.1	30535	4	2	.0165	C
Cu II					
2489.7	66419	5	5	.015	D
2544.8	108015	9	7	1.1	D
2689.3	108015	7	7	.41	D
2701.0	110366	5	5	.67	D
2703.2	110084	3	3	1.2	D
2713.5	108336	5	5	.68	D
2769.7	108015	7	7	.61	D
Dysprosium					
Dy I					
2862.7	34922	17	15	.065	D
2964.6	33722	17	17	.065	D
3147.7	35894	15	17	.11	D
3263.2	34770	15	13	.14	D
3511.0	32608	15	13	.31	D
3571.4	32126	15	13	.20	D
3757.1	34175	17	19	3.0	D
3868.8	33406	17	17	3.1	D
3967.5	32763	17	19	.87	D
4046.0	24709	17	15	1.5	D
4103.9	31411	13	11	1.7	D
4186.8	23878	17	17	1.32	C
4194.8	23832	17	17	.72	D
4211.7	23737	17	19	2.08	C
4218.1	27835	15	15	1.85	C
Dy I					
4221.1	27818	15	17	1.52	C
4225.2	30712	13	15	4.5	D
4268.3	27556	15	15	.036	D
4276.7	30427	13	13	.73	D
4292.0	27427	15	15	.058	D
4577.8	21839	17	19	.022	D
4589.4	21783	17	15	.13	D
4612.3	21675	17	15	.082	D
5077.7	19689	17	17	.0057	D
5301.6	18857	17	15	.011	D
5547.3	18022	17	17	.0027	C
5639.5	17727	17	19	.0047	C
5974.5	16733	17	17	.0040	C
5988.6	16694	17	15	.0053	C
6010.8	20766	15	15	.026	D
6088.3	20555	15	13	.035	D
6168.4	20341	15	17	.025	D
6259.1	15972	17	19	.0085	C
6579.4	15195	17	15	.0075	D
Erbium					
Er I					
3862.9	25880	13	13	2.5	D
4008.0	24943	13	15	2.6	D
4151.1	24083	13	11	1.8	D
Europium					
Eu I					
2372.9	42131	8	6	.19	D
2375.3	42087	8	8	.20	D
2379.7	42010	8	10	.20	D
2619.3	38167	8	10	.0070	D
2643.8	37813	8	8	.0066	D
2659.4	37591	8	10	.012	D
2682.6	37266	8	6	.012	D
2710.0	36890	8	10	.14	D
2724.0	36700	8	8	.12	D
2731.4	36601	8	8	.031	D
2732.6	36584	8	6	.037	D
2735.3	36549	8	10	.047	D
2738.6	36505	8	10	.013	D
2743.3	36442	8	6	.11	D
2745.6	36411	8	6	.050	D
2747.8	36382	8	8	.052	D
2772.9	36053	8	6	.010	D
2878.9	34726	8	10	.028	D
2892.5	34562	8	8	.10	D
2893.0	34556	8	6	.10	D
2909.0	34366	8	10	.069	D
2958.9	33787	8	6	.016	D
3059.0	32681	8	8	.038	D
3067.0	32596	8	10	.0091	D
3106.2	32185	8	10	.055	D
3111.4	32130	8	10	.30	D
3168.3	31554	8	10	.069	D
3185.5	31383	8	10	.0058	D
3210.6	31138	8	8	.11	D
3212.8	31116	8	8	.29	D
3213.8	31107	8	6	.18	D
3235.1	30902	8	10	.010	D
3241.4	30842	8	8	.023	D
3246.0	30798	8	6	.014	D

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Eu I				
3247.6	30784	8	8	.023	D
3322.3	30091	8	6	.035	D
3334.3	29983	8	6	.34	D
3350.4	29839	8	10	.015	D
3353.7	29809	8	8	.0058	D
3457.1	28918	8	8	.0084	D
3467.9	28828	8	8	.010	D
3589.3	27853	8	6	.0069	D
4594.0	21761	8	10	1.4	D
4627.2	21605	8	8	1.3	D
4661.9	21445	8	6	1.3	D
5645.8	17707	8	6	.0054	D
5765.2	17341	8	8	.011	D
6018.2	16612	8	10	.0085	D
6291.3	15891	8	6	.0018	D
6864.5	14564	8	10	.0058	D
7106.5	14068	8	8	.0026	D
	Fluorine				
	F I				
806.96	123921	4	6	3.3	C
809.60	123922	2	4	2.8	C
951.87	105056	4	2	2.6	C
954.83	104731	4	4	6.4	C
955.55	105056	2	2	5.1	C
958.52	104731	2	4	1.3	C
6239.7	118428	6	4	.25	D
6348.5	118428	4	4	.18	D
6413.7	118428	2	4	.11	D
6708.3	117309	6	4	.014	D
6774.0	117164	6	6	.10	D
6795.5	117392	4	2	.052	D
6834.3	117309	4	4	.21	D
6856.0	116987	6	8	.42	D
6870.2	117392	2	2	.38	D
6902.5	117164	4	6	.32	D
6909.8	117309	2	4	.22	D
6966.4	119082	4	2	.11	D
7037.5	118937	4	4	.30	D
7127.9	119082	2	2	.38	D
7309.0	137599	6	8	.47	D
7311.0	118405	4	2	.39	D
7314.3	137590	4	6	.48	D
7332.0	116041	6	4	.31	D
7398.7	115918	6	6	.31	D
7425.7	116144	4	2	.34	D
7482.7	116041	4	4	.056	D
7489.2	118405	2	2	.11	D
7514.9	116144	2	2	.052	D
7552.2	115918	4	6	.078	D
7573.4	116041	2	4	.10	D
7607.2	117873	4	4	.070	D
7754.7	117623	4	6	.30	D
7800.2	117873	2	4	.21	D
	Gallium				
	Ga I				
2195.4	45537	2	2	.019	C
2199.7	46274	4	2	.033	C
2214.4	45972	4	6	.012	C
2235.9	45537	4	2	.043	C
2255.0	44332	2	2	.031	C
2259.2	45076	4	6	.031	C
2294.2	43575	2	4	.070	C
2297.9	44332	4	2	.058	C
2338.2	43581	4	6	.098	C
2371.3	42159	2	2	.057	C
2418.7	42159	4	2	.10	C
2450.1	40803	2	4	.28	C
2500.2	40811	4	6	.34	C
2659.9	37585	2	2	.12	C
2719.7	37585	4	2	.23	C
2874.2	34782	2	4	1.2	C
2943.6	34788	4	6	1.4	C
2944.2	34782	4	4	.27	C
4033.0	24789	2	2	.49	C
4172.0	24789	4	2	.92	C
	Ga II				
829.60	120540	1	3	.22	D
1414.4	70700	1	3	18.8	C
	Germanium				
	Ge I				
1944.7	51978	3	1	.70	C
1955.1	51705	3	3	.28	C
1988.3	51705	5	3	.25	C
1998.9	51438	5	5	.55	C
2041.7	48963	1	3	1.1	C
2065.2	48963	3	3	.85	C
2068.7	48882	3	5	1.2	C
2086.0	48480	3	5	.40	C
2094.3	49144	5	7	.97	C
2105.8	48882	5	5	.17	C
2256.0	51438	5	5	.032	C
2417.4	48480	5	5	.96	C
2498.0	40021	1	3	.13	C
2533.2	40021	3	3	.10	C
2589.2	40021	5	3	.051	C
2592.5	39118	3	5	.71	C
2651.2	39118	5	5	2.0	C
2651.6	37702	1	3	.85	C
2691.3	37702	3	3	.61	C
2709.6	37452	3	1	2.8	C
2754.6	37702	5	3	1.1	C
3039.1	40021	5	3	2.8	C
3124.8	39118	5	5	.031	C
3269.5	37702	5	3	.29	C
4226.6	40021	1	3	.21	C
4685.8	37702	1	3	.095	C
	Ge II				
999.10	100090	2	4	1.9	D
1016.6	100131	4	6	2.1	D
1017.1	100090	4	4	.35	D
1055.0	94784	2	2	.69	D
1075.1	94784	4	2	1.3	D
1237.1	80837	2	4	19.	D
1261.9	81013	4	6	22.	D
1264.7	80837	4	4	3.5	D
1602.5	62403	2	2	3.4	D
1649.2	62403	4	2	6.5	D
4741.8	100090	2	4	.46	D
4814.6	100131	4	6	.51	D
4824.1	100090	4	4	.086	D

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Ge II				
5131.8	100318	4	6	1.9	D
5178.5	100318	6	6	.13	D
5178.6	100317	6	8	2.0	D
5893.4	79367	2	4	.92	D
6021.0	79007	2	2	.84	D
6336.4	94784	2	2	.44	D
6484.2	94784	4	2	.85	D
	Gold				
	Au I				
2428.0	41174	2	4	1.5	D
2676.0	37359	2	2	1.1	D
	Helium				
	He I				
510.00	196079	1	3	.462	B
512.10	195275	1	3	.717	B
515.62	193943	1	3	1.3	B
522.21	191493	1	3	2.46	A
537.03	186209	1	3	5.66	A
584.33	171135	1	3	17.99	AA
2696.1	196935	3	9*	.00550	B
2723.2	196567	3	9*	.00780	B
2763.8	196027	3	9*	.0111	B
2829.1	195193	3	9*	.017	B
2945.1	193801	3	9*	.0320	A
3187.7	191217	3	9*	.05639	AA
3354.6	196079	1	3	.0130	B
3447.6	195275	1	3	.0232	A
3554.4	197213	9	15*	.0131	A
3587.3	196955	9	15*	.0205	C
3613.6	193943	1	3	.0390	A
3634.2	196595	9	15*	.0261	A
3705.0	196070	9	15*	.0444	C
3819.6	195260	9	15*	.0636	A
3833.6	197213	3	5	.00971	B
3867.5	194936	9	3*	.025	B
3871.8	196956	3	5	.0126	C
3888.7	185565	3	9*	.09478	AA
3926.5	196596	3	5	.0195	A
3964.7	191493	1	3	.0719	A
4009.3	196070	3	5	.0279	C
4026.2	193917	9	15*	.116	A
4120.8	193347	9	3*	.0444	A
4143.8	195261	3	5	.0485	A
4387.9	193918	3	5	.0894	A
4437.6	193664	3	1	.033	B
4471.5	191445	9	15*	.246	A
4713.2	190298	9	3*	.0955	A
4921.9	191447	3	5	.198	A
5015.7	186210	1	3	.1338	AA
5047.7	190940	3	1	.0675	A
5875.7	186102	9	15*	.7053	AA
6678.2	186105	3	5	.6339	AA
7065.2	183237	9	3*	.2786	AA
7281.4	184865	3	1	.1829	AA
8361.7	195193	3	9*	.00334	A
9463.6	193801	3	9*	.00501	A
9603.4	195275	1	3	.00610	A
9702.6	195868	9	3*	.00858	B
10311.	195260	9	15*	.0201	A
10668.	194936	9	3*	.0152	A
10830.	169087	3	9*	.1022	AA
10913.	195262	15	21*	.0212	B
10917.	195262	5	7	.0212	B
10997.	195193	15	9*	.0013	B
11013.	193943	1	3	.0100	A
11045.	195261	3	5	.0185	A
11226.	195115	3	1	.0108	A
11969.	193917	9	15*	.0358	A
12528.	191217	3	9*	.00710	A
12756.	193943	5	3	.0012	B
12785.	193921	15	21*	.0462	B
12791.	193921	5	7	.0461	B
12846.	193347	9	3*	.0289	A
12968.	193918	3	5	.0343	A
12985.	193801	15	9*	.0025	B
	Indium				
	In I				
2710.3	39098	4	6	.4	D
2713.9	39048	2	4	.4	D
3256.1	32915	4	6	1.3	D
3258.6	32892	2	4	1.2	D
4101.8	24373	2	2	.56	C
4511.3	24373	4	2	1.02	C
	In II				
2941.1	97025	3	1	1.4	D
	Iodine				
	I I				
1782.8	56093	4	4	2.71	C
1830.4	54633	4	6	.16	D
	Iron				
	Fe I				
1934.5	51692	9	7	.25	C
1937.3	51619	9	7	.22	C
1940.7	51945	7	5	.26	C
2084.1	47967	9	7	.37	C
2102.4	47967	7	7	.088	C
2113.0	48290	1	3	.19	C
2132.0	46889	9	9	.076	C
2166.8	46137	9	7	2.7	C
2191.8	46314	5	5	1.2	C
2196.0	46410	3	3	1.2	C
2200.7	46314	3	5	.28	C
2259.5	44244	9	11	.070	C
2276.0	43923	9	7	.17	C
2277.1	51630	7	5	37.	C
2287.3	44411	5	3	.34	C
2294.4	44459	3	1	.61	C
2300.1	44166	5	7	.080	C
2309.0	44184	3	5	.15	C
2313.1	43923	5	7	.14	C
2320.4	43499	7	9	.12	C
2373.6	42533	7	7	.067	C
2374.5	43079	1	3	.29	C
2462.2	41018	7	5	.15	C
2462.6	40594	9	9	.58	C
2479.8	41018	5	5	1.8	C
2483.3	40257	9	11	4.9	C
2488.1	40594	7	9	4.7	C

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Fe I				
2490.6	40842	5	7	3.8	C
2491.2	41018	3	5	3.0	C
2501.1	39970	9	7	.68	C
2510.8	40231	7	5	1.3	C
2518.1	40405	5	3	1.9	C
2522.8	39626	9	9	2.9	C
2524.3	40491	3	1	3.4	C
2527.4	39970	7	7	1.9	C
2529.1	40231	5	5	.98	C
2535.6	40405	1	3	.97	C
2541.0	40231	3	5	.92	C
2546.0	39970	5	7	.67	C
2549.6	39626	7	9	.36	C
2584.5	45608	11	13	.46	C
2719.0	36767	9	7	1.4	C
2720.9	37158	7	5	1.1	C
2723.6	37410	5	3	.64	C
2737.3	37410	3	3	.85	C
2742.4	37158	5	5	.63	C
2744.1	37410	1	3	.35	C
2750.1	36767	7	7	.39	C
2756.3	37158	3	5	.20	C
2788.1	42784	11	13	.63	C
2894.5	52916	5	5	.63	C
2899.4	52858	5	3	.61	C
2923.3	60549	11	11	1.7	C
2925.4	56423	7	9	.19	C
2936.9	34040	9	9	.14	C
2954.7	52213	5	7	.12	C
2966.9	33695	9	11	.272	B
2980.5	55791	7	7	.22	C
2983.6	33507	9	7	.280	B
2990.4	55430	9	11	.40	C
2996.4	52916	3	5	.19	C
2999.5	40257	11	11	.23	C
3000.9	34017	5	3	.642	B
3008.1	34122	3	1	1.07	B
3009.1	52613	13	11	.079	C
3009.6	40594	9	9	.18	C
3011.5	55446	7	9	.48	C
3019.0	40842	7	7	.15	C
3037.4	33802	3	5	.32	C
3042.7	40842	5	7	.066	C
3047.6	33507	5	7	.284	B
3053.1	52297	3	5	.18	C
3057.4	39626	11	9	.45	C
3059.1	33096	7	9	.18	C
3067.2	39970	9	7	.35	C
3075.7	40231	7	5	.30	C
3083.7	40405	5	3	.35	C
3098.2	53983	11	11	.11	C
3100.7	39970	7	7	.16	C
3119.5	51668	11	9	.096	C
3120.4	51826	9	7	.10	C
3160.7	51192	9	9	.19	C
3161.9	50968	11	13	.12	C
3166.4	52213	9	7	.14	C
3175.4	50833	11	11	.13	C
3199.5	50808	9	9	.27	C
3205.4	51208	3	3	1.2	C
3215.9	50999	5	5	.81	C
3217.4	50423	11	9	.23	C
3225.8	50342	11	13	1.0	C
3231.0	50699	7	5	.39	C
3233.1	57028	13	15	.55	C
3234.0	50475	9	9	.20	C
3248.2	50534	7	7	.22	C
3253.6	56951	7	9	.18	C
3254.4	57070	11	13	.51	C
3265.6	48163	7	5	.39	C
3271.0	48290	5	3	.67	C
3280.3	57104	9	11	.55	C
3282.9	56859	3	5	.31	C
3292.0	56593	7	9	.62	C
3292.6	48290	3	3	.31	C
3306.0	47967	5	7	.48	C
3307.2	56334	13	13	.20	C
3314.7	56783	5	7	.70	C
3323.7	52916	5	5	.31	C
3328.9	56383	11	11	.27	C
3337.7	51668	11	9	.067	C
3355.2	56423	9	9	.33	C
3369.5	51668	9	9	.25	C
3370.8	51374	11	11	.34	C
3380.1	51826	7	7	.24	C
3384.0	47093	7	7	.11	C
3392.7	47017	7	7	.26	C
3399.3	47136	5	5	.39	C
3402.3	55490	13	13	.29	C
3406.4	55754	3	5	.30	C
3407.5	46889	7	9	.60	C
3410.2	56859	3	5	.48	C
3411.4	51305	9	9	.065	C
3413.1	47017	5	7	.37	C
3417.8	47177	3	3	.52	C
3418.5	47171	3	1	1.3	C
3424.3	46745	7	7	.21	C
3425.0	53763	9	7	.29	C
3427.1	46721	7	9	.56	C
3428.2	46889	5	5	.22	C
3445.1	46745	5	7	.28	C
3447.3	46727	5	5	.11	C
3450.3	46902	3	3	.24	C
3495.3	49243	9	7	.13	C
3497.1	46137	7	7	.15	C
3521.8	46314	3	5	.11	C
3524.1	49243	7	5	.091	C
3527.8	51335	9	9	.20	C
3529.8	51567	3	3	.78	C
3536.6	51461	5	7	.80	C
3540.1	51350	7	9	.12	C
3541.1	51229	9	11	.64	C
3542.1	51335	7	9	.76	C
3552.8	51331	5	5	.17	C
3553.7	56951	11	9	.83	C
3556.9	51103	9	11	.45	C
3559.5	52858	3	3	.22	C
3560.7	54301	7	9	.077	C
3565.4	35768	7	9	.39	C
3570.1	35379	9	11	.677	B
3572.0	50833	11	11	.25	C
3581.2	34844	11	13	1.02	B
3582.2	54014	13	11	.25	C
3587.0	35856	5	5	.17	C

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Fe I				
3594.6	50808	9	9	.28	C
3599.6	56593	11	9	.19	C
3603.2	49461	11	11	.27	C
3605.5	49727	9	9	.65	C
3606.7	49434	11	13	.84	C
3608.9	35856	3	5	.814	B
3610.2	50342	13	13	.50	C
3612.1	50523	11	13	.077	C
3617.8	51969	5	7	.66	C
3618.8	35612	5	7	.73	C
3621.5	49604	9	11	.52	C
3622.0	49851	7	7	.53	C
3623.2	46982	13	13	.076	C
3631.5	35257	7	9	.52	C
3632.0	52297	3	5	.50	C
3638.3	49727	7	9	.27	C
3640.4	49461	9	11	.39	C
3645.8	52512	1	3	.58	C
3647.8	34782	9	11	.292	B
3649.5	49109	11	9	.43	C
3651.5	49628	7	9	.64	C
3655.5	50187	5	5	.12	C
3659.5	47106	9	9	.068	C
3669.5	49243	9	7	.30	C
3670.1	51023	11	13	.078	C
3676.3	47835	9	11	.061	C
3677.6	49433	7	5	.82	C
3682.2	55754	5	5	1.7	C
3684.1	49135	9	7	.34	C
3686.0	50833	9	11	.26	C
3687.5	34040	11	9	.0801	B
3690.7	55907	11	11	.28	C
3694.0	51570	5	7	.70	C
3697.4	51219	7	7	.21	C
3701.1	51192	7	9	.49	C
3704.5	48703	11	9	.14	C
3709.2	34329	9	7	.156	B
3719.9	26875	9	11	.163	B
3724.4	45221	5	7	.13	C
3727.6	34547	7	5	.225	B
3730.4	51374	9	11	.13	C
3732.4	44512	5	5	.28	C
3734.9	33695	11	11	.902	B
3737.1	27167	7	9	.142	C
3738.3	53094	11	13	.38	C
3740.2	52954	7	7	.19	C
3742.6	50423	9	9	.11	C
3744.1	51208	5	3	.38	C
3745.6	27395	5	7	.115	B
3749.5	34040	9	9	.764	B
3753.6	44184	7	5	.11	C
3756.9	55430	11	11	.25	C
3758.2	34329	7	7	.634	B
3760.1	45978	13	15	.057	C
3763.8	34547	5	5	.544	B
3765.5	52655	13	15	.99	C
3767.2	34692	3	3	.640	B
3787.2	55754	5	5	.12	C
3787.9	34547	3	5	.129	B
3794.3	46136	9	11	.046	C
3795.0	34329	5	7	.115	B
3798.5	33695	9	11	.0323	B
3799.5	34040	7	9	.0732	B
3804.0	53155	11	9	.052	C
3805.3	52899	9	11	1.0	C
3806.2	53808	3	3	.25	C
3806.7	52613	11	11	.55	C
3807.5	44184	3	5	.097	C
3810.8	52858	5	3	.24	C
3813.0	33947	7	5	.0792	B
3813.9	55526	13	11	.091	C
3815.8	38175	9	7	1.3	C
3820.4	33096	11	9	.668	B
3821.2	52514	11	13	.70	C
3821.8	47197	5	5	.089	C
3825.9	33507	9	7	.598	B
3827.8	38678	7	5	1.1	C
3833.3	46721	9	9	.059	C
3834.2	33802	7	5	.453	B
3836.3	52683	5	5	.39	C
3839.3	50614	9	9	.29	C
3840.4	34017	5	3	.470	B
3841.0	38996	5	3	1.4	C
3843.3	50587	9	7	.48	C
3846.8	52213	7	7	.67	C
3850.0	34122	3	1	.606	B
3859.2	45295	13	11	.087	C
3859.9	25900	9	9	.0970	B
3865.5	34017	3	3	.155	B
3867.2	50187	5	5	.35	C
3871.8	49604	11	11	.070	C
3872.5	33802	5	5	.105	B
3873.8	45428	11	9	.082	C
3878.0	33507	7	7	.0772	B
3883.3	51969	7	7	.17	C
3884.4	47453	11	9	.042	C
3888.5	38678	5	5	.27	C
3891.9	53230	3	3	.40	C
3893.4	49461	11	11	.14	C
3900.5	51771	7	7	.086	C
3902.9	38175	7	7	.24	C
3903.9	49727	9	9	.097	C
3916.7	51630	13	11	.12	C
3919.1	49628	9	9	.045	C
3942.4	48305	3	5	.11	C
3951.2	51708	3	5	.36	C
3952.6	47008	11	11	.052	C
3953.2	49628	7	9	.043	C
3963.1	51705	3	5	.17	C
3967.4	51826	9	7	.24	C
3969.3	37163	9	7	.24	C
3971.3	46889	11	9	.068	C
3973.7	53763	5	7	.080	C
3977.7	42860	5	5	.082	C
3981.8	47106	9	9	.046	C
3984.0	47093	9	7	.089	C
3985.4	51708	5	5	.082	C
3997.0	54811	9	9	.074	C
3997.4	47008	9	11	.16	C
3998.1	46721	11	9	.075	C
4005.2	37521	7	5	.22	C
4014.5	53722	11	11	.24	C
4017.2	49461	9	11	.053	C
4021.9	47106	7	9	.10	C

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Fe I				
4032.0	51201	3	5	.086	C
4045.8	36686	9	9	.75	C
4062.4	47556	3	3	.23	C
4063.6	37163	7	7	.69	C
4068.0	50475	9	9	.17	C
4070.8	50699	7	5	.14	C
4071.7	37521	5	5	.80	C
4073.8	50880	5	3	.19	C
4074.8	49109	9	9	.056	C
4076.6	50423	9	9	.20	C
4084.5	51350	11	9	.12	C
4085.3	50611	7	7	.12	C
4098.2	50534	7	7	.082	C
4107.5	47177	5	3	.25	C
4109.8	47272	3	3	.19	C
4113.0	58002	11	13	.15	C
4127.6	47272	1	3	.16	C
4132.9	47136	3	5	.11	C
4134.7	47017	5	7	.18	C
4137.0	51708	3	5	.23	C
4143.9	36686	7	9	.16	C
4149.4	50968	11	13	.043	C
4153.9	51462	7	9	.24	C
4154.8	51229	9	11	.15	C
4156.8	46889	5	5	.19	C
4170.9	48305	5	5	.072	C
4172.1	50187	7	5	.12	C
4175.6	46889	3	5	.17	C
4184.9	46727	5	5	.12	C
4187.0	43634	7	5	.23	C
4187.8	43435	9	7	.16	C
4196.2	51219	7	7	.11	C
4210.3	43764	3	3	.20	C
4217.6	51370	3	5	.24	C
4219.4	52514	11	13	.38	C
4222.2	43435	7	7	.063	C
4224.2	50833	9	11	.14	C
4225.5	51219	5	7	.17	C
4233.6	43634	3	5	.20	C
4238.8	50980	7	9	.22	C
4246.1	52916	7	5	.069	C
4250.1	43435	5	7	.23	C
4282.4	40895	7	5	.13	C
4307.9	35768	7	9	.35	C
4315.1	40895	5	5	.090	C
4325.8	36079	5	7	.51	C
4327.1	51708	5	5	.094	C
4369.8	47453	9	9	.074	C
4383.5	34782	9	11	.46	C
4388.4	51837	7	7	.13	C
4401.3	51771	7	7	.069	C
4404.8	35257	7	9	.25	C
4415.1	35612	5	7	.13	C
4443.2	45552	1	3	.13	C
4466.6	45221	5	7	.13	C
4469.4	51837	5	7	.27	C
4528.6	39626	7	9	.063	C
4547.9	50587	5	7	.078	C
4736.8	47006	9	11	.050	C
4789.7	49477	5	5	.084	C
4859.7	43764	5	3	.15	C
4871.3	43634	7	5	.22	C
4872.1	43764	3	3	.24	C
4878.2	43764	1	3	.11	C
4890.8	43634	5	5	.21	C
4891.5	43435	9	7	.30	C
4903.3	43634	3	5	.054	C
4919.0	43435	7	7	.17	C
4920.5	43163	11	9	.36	C
4966.1	47006	11	11	.037	C
4973.1	52040	3	3	.12	C
4989.0	53546	7	7	.058	C
5001.9	51294	9	7	.40	C
5014.9	51740	7	5	.31	C
5022.2	52040	5	3	.27	C
5074.7	53739	9	11	.15	C
5090.8	53967	7	5	.21	C
5121.6	54067	5	5	.086	C
5137.4	53155	11	9	.11	C
5208.6	45334	7	5	.060	C
5232.9	42816	9	11	.15	C
5242.5	48383	13	11	.032	C
5263.3	45334	5	5	.061	C
5266.6	43163	7	9	.088	C
5281.8	43435	5	7	.038	C
5302.3	45334	3	5	.073	C
5324.2	44677	9	9	.15	C
5339.9	45061	5	7	.071	C
5367.5	54237	7	9	.59	C
5370.0	53874	9	11	.48	C
5383.4	53353	11	13	.59	C
5393.2	44677	7	9	.037	C
5410.9	54555	7	9	.49	C
5415.2	53841	11	13	.68	C
5463.3	54067	9	9	.33	C
5473.9	51771	7	7	.057	C
5569.6	45509	5	3	.21	C
5572.8	45334	7	5	.22	C
5586.8	45061	9	7	.19	C
5615.6	44677	11	9	.17	C
5624.5	45334	5	5	.062	C
5658.8	45061	7	7	.042	C
5753.1	51740	3	5	.072	C
5763.0	51294	5	7	.10	C
	Fe II				
2029.2	65110	10	8	.076	D
2040.7	64832	10	10	.46	D
2051.0	65110	8	8	.42	D
2296.7	65110	10	8	.037	D
2303.3	64832	12	10	.054	D
2369.2	64832	10	10	.026	D
2379.0	64832	8	10	.064	D
2388.4	62662	10	12	.14	D
2433.5	62662	10	12	.091	D
2555.0	65110	8	8	.019	D
2559.8	65110	6	8	.22	D
2561.6	64832	10	10	.0081	D
2573.2	64832	8	10	.11	D
2591.5	46967	6	6	.52	C
2592.8	71433	14	16	2.25	C
2598.0	64832	10	10	.020	D
2598.4	38859	8	6	1.3	C
2599.4	38459	10	10	2.22	C

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Fe II				
2623.1	70987	14	14	.092	D
2625.5	70987	12	14	2.04	C
2625.7	38459	8	10	.34	C
2664.7	64832	8	10	1.50	C
2666.6	65110	6	8	1.62	C
2684.9	62662	12	12	.0043	D
2712.4	62662	10	12	.11	D
2753.3	62662	10	12	1.71	C
2879.2	65110	10	8	.029	D
2902.5	64832	10	10	.038	D
2910.8	65110	8	8	.0055	D
3002.3	65110	6	8	.018	D
3044.8	64832	8	10	.011	D
3131.7	64832	12	10	.012	D
3162.8	65110	8	8	.042	D
3186.7	45044	4	4	.039	C
3187.3	64832	10	10	.028	D
3213.3	44785	4	6	.065	C
3277.3	38459	8	10	.0023	D
3360.1	62662	12	12	.0084	D
4515.3	45080	6	6	.0018	D
4520.2	44754	10	8	.0010	D
4583.8	44447	10	8	.0063	C
4629.3	44233	10	10	.0013	D
4923.9	43621	6	4	.030	C
4954.0	65110	6	8	.0016	D
5018.4	43239	6	6	.026	C
5019.5	64832	8	10	.0015	D
	Fe XVI				
50.350	1986100	2	4	2120.	B
50.555	1978040	2	2	2100.	B
62.879	1867530	2	2	1110.	B
63.719	1867530	4	2	2140.	B
335.41	298140	2	4	77.5	B
360.80	277160	2	2	62.3	B
	Fe XVIII				
93.931	1064610	4	2	690.	D
103.95	1064610	2	2	260.	D
	Fe XXI				
98.37	1265800	5	3	700.	D
99.43	1095500	9	3*	1000.	D
113.34	1132280	5	5	470.	D
	Fe XXIII				
132.83	752840	1	3	195.	B
	Fe XXIV				
10.619	9417100	2	4	7.28(+4)	B
10.663	9378200	2	2	7.51(+4)	B
11.124	9467100	6	10*	2.18(+5)	B
192.04	520720	2	4	43.	B
255.10	392000	2	2	18.	B
	Krypton				
	Kr I				
4274.0	103363	5	5	.026	D
4351.4	108822	3	1	.032	D
4362.6	102887	5	3	.0084	D
4376.1	103762	3	1	.056	D
4400.0	108568	3	5	.020	D
4410.4	108514	3	3	.0044	D
	Kr I				
4425.2	108438	3	3	.0097	D
4453.9	103363	3	5	.0078	D
4463.7	103314	3	3	.023	D
4502.4	103121	3	5	.0092	D
5562.2	97945	5	5	.0028	D
5570.3	97919	5	3	.021	D
5649.6	102887	1	3	.0037	D
5870.9	97945	3	5	.018	D
6904.7	105648	3	5	.013	D
7224.1	105007	3	5	.014	D
7587.4	94093	3	1	.51	D
7601.5	93123	5	5	.31	D
7685.2	98855	3	1	.49	D
7694.5	92964	5	3	.056	D
7854.8	97919	1	3	.23	D
8059.5	97596	1	3	.19	D
8104.4	92307	5	5	.13	D
8112.9	92294	5	7	.36	D
8190.1	93123	3	5	.11	D
8263.2	97945	3	5	.35	D
8281.1	97919	3	3	.19	D
8298.1	92964	3	3	.32	D
8508.9	97596	3	3	.24	D
8776.7	92307	3	5	.27	D
8928.7	91169	5	3	.37	D
	Kr II				
4250.6	141996	4	4	.12	D
4292.9	138381	4	4	.96	D
4355.5	135783	6	8	1.0	D
4431.7	140163	2	2	1.8	D
4436.8	140137	2	4	.66	D
4577.2	149705	6	8	.96	D
4583.0	157885	6	4	.76	D
4615.3	140137	4	4	.54	D
4619.2	140119	4	6	.81	D
4633.9	149173	4	6	.71	D
4658.9	134288	6	4	.65	D
4739.0	133926	6	6	.76	D
4762.4	141996	2	4	.42	D
4765.7	136071	4	6	.67	D
4811.8	138381	2	4	.17	D
4825.2	141723	2	4	.19	D
4832.1	135783	4	2	.73	D
5208.3	134288	4	4	.14	D
5308.7	133926	4	6	.024	D
7407.0	133926	6	6	.070	D
	Lead				
	Pb I				
2022.0	49440	1	3	.052	D
2053.3	48687	1	3	.12	D
2170.0	46068	1	3	1.5	D
2401.9	49440	3	3	.19	D
2446.2	48687	3	3	.25	D
2476.4	48189	3	5	.28	D
2577.3	49440	5	3	.50	D
2613.7	46068	3	3	.27	D
2614.2	46061	3	5	1.9	D
2628.3	48687	5	3	.031	D
2657.1	45443	3	5	9.8 (-4)	D
2663.2	48189	5	5	.71	D

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Pb I				
2802.0	46329	5	7	1.6	D
2823.2	46061	5	5	.26	D
2833.1	35287	1	3	.58	D
2873.3	45443	5	5	.37	D
3572.7	49440	5	3	.99	D
3639.6	35287	3	3	.34	D
3671.5	48687	5	3	.44	D
3683.5	34960	3	1	1.5	D
3739.9	48189	5	5	.73	D
4019.6	46329	5	7	.035	D
4057.8	35287	5	3	.89	D
4062.1	46068	5	3	.92	D
4168.0	45443	5	5	.012	D
5005.4	49440	1	3	.27	D
5201.4	48687	1	3	.19	D
7229.0	35287	5	3	.0089	D
	Lithium				
	Li I				
2741.2	36470	2	6*	.013	D
3232.7	30925	2	6*	.012	B
4602.8	36623	2	4	.197	C
4602.9	36623	4	6	.24	C
6103.5	31283	2	4	.60	C
6103.7	31283	4	6	.71	C
6103.7	31283	4	4	.12	C
6707.8	14904	2	4	.372	B
6707.9	14904	2	2	.372	B
	Lutetium				
	Lu I				
3376.5	29608	4	4	2.23	B
3567.8	28020	4	6	.59	C
3620.3	29608	6	4	.011	D
3841.2	28020	6	6	.25	C
4518.6	22125	4	4	.21	B
	Magnesium				
	Mg I				
2025.8	49347	1	3	.84	D
2779.8	57854	9	9*	5.2	C
2850.0	56968	9	15*	.23	C
2852.1	35051	1	3	5.3	D
3094.9	54192	9	15*	.52	C
3329.9	51873	1	3	.033	C
3332.2	51873	3	3	.097	C
3336.7	51873	5	3	.16	C
3835.3	47957	9	15*	1.68	B
4703.0	56308	3	5	.255	C
5167.3	41197	1	3	.116	B
5172.7	41197	3	3	.346	B
5183.6	41197	5	3	.575	B
5528.4	53135	3	5	.199	C
	Mg II				
1239.9	80650	2	4	.014	C
1240.4	80620	2	2	.014	C
2660.8	109062	10	14*	.38	D
2790.8	71491	2	4	4.0	C
2795.5	35761	2	4	2.6	C
2797.9	71491	4	4	.79	D
2798.1	71490	4	6	4.8	C
2802.7	35669	2	2	2.6	C
2928.8	69805	2	2	1.2	C
2936.5	69805	4	2	2.3	C
3104.8	103690	10	14*	.81	C
3848.2	97469	6	4	.028	C
3848.3	97469	4	4	.0030	D
3850.4	97455	4	2	.030	C
4481.2	93800	10	14*	2.23	C
9218.3	80650	2	4	.36	C
9244.3	80620	2	2	.36	C
	Mg IV				
320.99	311532	4	2	120.	D
323.31	311532	2	2	59.	D
1219.0	679098	6	6	5.9	D
1375.5	677361	4	4	4.5	D
1459.6	612231	6	4	4.6	D
1495.5	679098	4	6	6.4	D
1510.7	678426	4	4	6.7	D
1683.0	603137	6	8	5.8	D
1698.8	604002	4	6	3.9	D
1893.9	596521	6	6	2.8	D
	Mg VI				
269.92	424600	10	6*	310.	D
292.53	424600	6	6*	90.	D
314.64	400600	6	2*	180.	D
349.15	340600	10	10*	61.	C
387.94	340600	6	10*	13.	D
399.29	250445	4	2	28.	C
400.68	249578	4	4	28.	C
403.32	247945	4	6	27.	C
	Mg VII				
277.01	362128	3	3	95.	C
278.41	362128	5	3	150.	C
280.74	397700	5	3	200.	D
319.02	354900	5	5	89.	C
366.42	274922	9	9*	44.	C
433.04	232934	9	15*	16.	C
1334.3	1125850	5	5	5.3	C
1410.0	1196770	5	5	2.57	C
1487.0	1192185	3	5	3.02	C
1487.9	1193061	5	7	3.66	C
	Mg VIII				
74.976	1335965	6	10*	4300.	D
315.02	320742	4	4	120.	C
342.29	524437	10	6*	63.	D
353.86	414380	4	4	38.9	C
356.00	414380	6	4	57.	C
428.52	465654	10	10*	32.4	C
434.62	232290	6	10*	16.	C
489.33	524437	6	6*	39.	D
686.92	465654	6	10*	9.4	D
	Mg IX				
62.751	1593600	1	3	2870.	B
67.189	1631500	9	15*	6200.	C
71.965	1532700	9	3*	1220.	C
72.312	1654583	3	5	4430.	C
77.737	1558076	3	1	392.	C
368.07	271687	1	3	52.7	B
438.69	499640	3	1	79.	C

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Mg IX				
443.74	368500	9	9*	41.9	C
749.55	405100	3	5	8.2	C
1639.8	1654583	3	5	2.1	D
2814.2	1593600	1	3	.335	C
	Mg X				
57.876	1727832	2	4	2090.	B
57.920	1726519	2	2	2090.	B
63.152	1743410	2	4	5600.	B
63.295	1743880	4	6	6700.	B
609.79	163976	2	4	7.53	B
624.94	159929	2	2	7.01	B
2212.5	1727832	2	4	.964	B
2278.7	1726519	2	2	.882	B
5918.7	1743410	2	4	.0320	C
6229.6	1743880	4	6	.0330	C
	Mg XI				
7.310	13680600	1	3	1.15(+4)	B
7.473	13381100	1	3	2.27(+4)	B
7.850	12738400	1	3	5.50(+4)	B
9.169	10907300	1	3	1.97(+5)	B
	Manganese				
	Mn I				
2794.8	35770	6	8	3.7	C
2798.3	35726	6	6	3.6	C
2801.1	35690	6	4	3.7	C
3007.7	58520	6	8	.18	D
3011.4	58486	8	10	.31	D
3016.5	58427	10	12	.29	D
3043.4	58137	8	8	.59	D
3044.6	49888	10	8	.57	D
3045.6	58110	10	10	.67	D
3045.8	58110	8	10	.17	D
3046.6	67753	10	12	.13	D
3047.0	58075	12	12	.61	D
3054.4	50013	8	6	.46	D
3066.0	49888	8	8	.16	D
3073.1	50099	4	4	.37	D
3082.7	66569	14	14	.29	D
3110.7	59340	6	8	.27	D
3113.8	66356	12	10	.26	D
3122.9	66356	10	10	.19	D
3126.9	66395	8	6	.23	D
3132.3	66855	10	10	.21	D
3132.8	66334	8	8	.27	D
3160.2	66574	10	12	.14	D
3175.6	66523	8	10	.18	D
3175.7	66419	10	12	.12	D
3190.0	66454	6	8	.16	D
3201.1	66395	4	6	.22	D
3212.9	48168	10	10	.16	D
3228.1	48021	10	12	.64	D
3230.2	65887	10	12	.19	D
3230.7	48226	8	8	.35	D
3238.7	65909	8	10	.12	D
3243.8	48271	6	6	.53	D
3256.1	48271	4	6	.50	D
3258.4	48318	2	2	.97	D
3260.2	48301	2	4	.38	D
3264.7	47904	8	10	.14	D
3267.8	64732	14	14	.35	D
3268.7	64410	6	8	.33	D
3270.4	64820	12	12	.26	D
3273.0	64888	10	10	.27	D
3278.6	47775	8	8	.0091	D
3298.2	57512	6	4	.28	D
3420.8	63364	14	14	.12	D
3463.7	66600	8	8	.32	C
3470.0	66600	6	8	.24	C
3511.8	65887	12	12	.27	C
3535.3	65909	10	10	.17	C
3559.8	65873	6	6	.21	C
3577.9	44994	10	8	.94	C
3601.3	65769	12	10	.23	C
3607.5	44994	8	8	.23	C
3608.5	45156	6	6	.36	C
3610.3	45259	4	4	.42	C
3635.7	65617	10	8	.21	C
3660.4	64732	12	14	.91	C
3677.0	64820	10	12	.73	C
3680.2	64585	12	10	.19	C
3682.1	64888	8	10	.76	D
3684.9	64920	6	8	.26	C
3706.1	61226	12	14	1.4	C
3718.9	61226	10	12	.96	C
3729.5	61744	10	12	.066	D
3731.9	61211	8	10	1.0	C
3746.6	60934	12	12	.16	C
3756.6	60956	10	10	.14	C
3767.7	60957	8	8	.14	C
3768.2	61469	10	12	.071	C
3771.4	69561	14	14	.19	C
3773.9	69630	12	12	.25	C
3800.6	57306	6	8	.27	C
3801.9	51561	12	12	.064	C
3806.7	43314	10	12	.38	C
3809.6	43524	8	8	.20	C
3823.5	43429	8	10	.44	C
3823.9	43596	6	6	.36	C
3833.9	43644	4	4	.52	C
3834.4	43524	6	8	.52	D
3839.8	43673	2	2	.58	C
3844.0	43644	2	4	.29	C
3872.1	63449	10	12	.077	C
3873.2	63548	8	10	.11	C
3889.5	68843	12	14	.31	C
3898.4	59470	6	8	.17	C
3899.3	60102	4	6	.24	C
3911.1	56562	6	6	.13	D
3919.3	66738	8	8	.088	D
3923.3	59732	12	10	.13	C
3924.1	56602	2	4	.94	D
3926.5	56462	6	8	.54	C
3929.7	59784	10	8	.092	C
3931.5	63548	10	10	.082	C
3936.8	59818	8	6	.12	C
3952.8	59117	6	6	.41	D
3975.9	59990	2	4	.18	D
3977.1	59600	4	6	.16	D
3980.1	66149	10	8	.13	D
3982.2	59568	4	2	.35	D
3982.6	50383	6	4	.23	D
3982.9	66504	6	4	.55	D

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
		Mn I			
3986.8	50341	12	10	.11	D
3987.1	50359	10	8	.10	D
4003.3	62393	12	10	.11	D
4011.9	66149	8	8	.23	D
4018.1	41933	10	8	.33	C
4026.4	50095	12	14	.089	D
4030.8	24802	6	8	.19	C
4031.8	50081	10	12	.073	D
4033.1	24788	6	6	.18	C
4034.5	24779	6	4	.18	C
4041.4	41789	10	10	1.0	C
4048.8	42144	6	4	.75	C
4052.5	59784	6	8	.38	D
4055.5	41933	8	8	.61	C
4058.9	42199	4	2	1.0	C
4061.7	49415	8	6	.19	D
4063.5	42054	6	6	.22	C
4065.1	58843	12	14	.25	D
4066.2	65617	10	8	.22	D
4079.4	42144	2	4	.38	C
4082.9	42054	4	6	.37	C
4083.6	41933	6	8	.28	C
4089.9	58867	8	10	.17	D
4092.4	59470	8	8	.14	D
4099.4	65617	8	8	.11	D
4105.4	59290	10	8	.17	D
4107.9	61485	12	10	.097	D
4114.4	59340	8	8	.15	D
4116.6	62075	6	6	.12	D
4125.8	65262	10	10	.070	D
4132.3	68716	8	10	.15	D
4135.0	58427	12	12	.30	D
4141.1	58486	10	10	.26	D
4147.5	51305	6	6	.066	D
4148.8	58520	8	8	.23	D
4176.6	58075	14	12	.21	D
4182.3	61913	12	14	.092	D
4190.0	58110	12	10	.20	D
4201.8	58137	10	8	.23	D
4220.6	57512	6	4	.16	D
4239.7	47299	4	2	.39	D
4257.7	47299	2	2	.37	D
4261.3	61469	12	12	.081	D
4265.9	47155	4	4	.35	D
4278.7	61485	10	10	.068	D
4281.1	46901	6	6	.23	D
4300.2	60668	12	10	.087	D
4381.7	61485	8	10	.14	D
4411.9	60668	12	10	.26	D
4414.9	45941	8	6	.18	D
4419.8	60739	10	8	.21	D
4451.6	45754	8	8	.71	D
4452.5	59617	14	14	.059	D
4455.8	47216	4	6	.17	D
4457.0	47218	6	4	.20	D
4457.6	47216	6	6	.38	D
4458.3	47212	6	8	.28	D
4461.1	47212	8	8	.17	D
4462.0	47207	8	10	.43	D
4464.7	45941	6	6	.26	D
4479.4	63548	8	10	.34	D
4498.9	45941	4	6	.11	D
4502.2	45754	6	8	.078	D
4503.9	59617	12	14	.083	D
4605.4	59828	10	12	.36	D
4626.5	59617	12	14	.36	D
4709.7	44523	8	8	.077	D
4727.5	44696	6	6	.084	D
4754.0	39431	6	8	.38	D
4761.5	44815	2	4	.28	D
4762.4	44289	8	10	.57	D
4765.9	44696	4	6	.28	D
4766.4	44523	6	8	.45	D
4783.4	39431	8	8	.39	D
4823.5	39431	10	8	.45	D
		Mn II			
2933.1	43557	5	3	1.7	C
2939.3	43485	5	5	1.8	C
2949.2	43370	5	7	1.7	C
3439.0	38543	5	7	.0041	D
3442.0	43370	9	7	.43	C
3460.3	43485	7	5	.32	C
3474.0	43370	7	7	.079	C
3474.1	43557	5	3	.15	C
3482.9	43485	5	5	.20	C
3488.7	43557	3	3	.25	C
3495.8	43557	1	3	.11	C
3496.8	43370	5	7	.016	C
3497.5	43485	3	5	.051	C
		Mn XXIII			
12.03	8687000	2	4	1.5 (+5)	B
12.158	8708000	4	6	1.8 (+5)	B
		Mercury			
		Hg I			
2536.5	39412	1	3	.13	D
2752.8	73961	1	3	.057	D
2856.9	74405	3	1	.012	D
2893.6	73961	3	3	.16	D
2925.4	78216	5	3	.077	D
2967.3	71336	1	3	.45	D
3125.7	71396	3	5	.51	D
3341.5	73961	5	3	.27	D
4046.6	62350	1	3	.18	D
4077.8	63928	3	1	.041	D
4108.1	78404	3	1	.030	D
4339.2	77108	3	5	.080	D
4358.3	62350	3	3	.40	D
4916.1	74405	3	1	.13	D
5460.7	62350	5	3	.56	D
5769.6	71396	3	5	.61	D
6234.4	79964	1	3	.0053	D
6716.4	78813	1	3	.0043	D
6907.5	76824	3	5	.028	D
7728.8	76863	1	3	.0097	D
		Neodymium			
		Nd II			
3780.4	30247	16	18	.14	D
3805.4	28857	14	16	.69	D
3807.2	26772	10	12	.049	D
3863.3	25877	8	10	.15	D
3941.5	25877	10	10	.61	D

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Nd II				
3951.2	26772	12	12	.60	D
3973.3	30247	18	18	.63	D
3979.5	26772	10	12	.27	D
3990.1	28857	16	16	.52	D
4012.3	30002	18	20	.55	D
4061.1	28419	16	18	.44	D
4106.6	28857	14	16	.068	D
4109.5	26913	14	16	.37	D
4133.4	26772	14	12	.15	D
4156.1	25524	12	14	.34	D
4205.6	28857	18	16	.18	D
4284.5	28419	18	18	.085	D
4303.6	23230	8	10	.47	D
4325.8	26913	16	16	.16	D
4358.2	25524	14	14	.15	D
4382.7	25877	12	10	.040	D
4400.8	23230	10	10	.068	D
4451.6	25524	12	14	.25	D
4456.4	28419	16	18	.064	D
4463.0	26913	14	16	.18	D
4958.1	23230	12	10	.012	D
5130.6	30002	22	20	.16	D
5192.6	28419	20	18	.17	D
5249.6	26913	18	16	.18	D
5276.9	25877	12	10	.12	D
5293.2	25524	16	14	.12	D
5302.3	30247	20	18	.11	D
5311.5	26772	14	12	.11	D
5319.8	23230	12	10	.16	D
5357.0	28857	18	16	.18	D
5371.9	30002	20	20	.051	D
5485.7	28419	18	18	.057	D
5594.4	26913	16	16	.070	D
5620.6	30247	18	18	.13	D
5688.5	25524	14	14	.059	D
5718.1	28857	16	16	.087	D
5726.8	25877	10	10	.056	D
5740.9	26772	12	12	.072	D
5804.0	23230	10	10	.046	D
5865.1	28419	16	18	.013	D
6051.9	25877	12	10	.011	D
	Neon				
	Ne I				
615.63	162436	1	3	.38	C
618.67	161637	1	3	.93	C
619.10	161524	1	3	.33	C
626.82	159535	1	3	.74	C
629.74	158796	1	3	.48	C
735.90	135889	1	3	6.11	B
743.72	134459	1	3	.486	B
3369.8	163709	5	5	.0010	D
3369.9	163708	5	3	.0076	D
3375.6	163657	5	3	.0022	D
3417.9	163709	3	5	.0092	D
3418.0	163708	3	3	.0022	D
3423.9	163657	3	3	.0010	D
3447.7	163038	5	5	.021	D
3450.8	163013	5	3	.0049	D
3454.2	163401	3	1	.037	D
3460.5	163708	1	3	.0070	D
3464.3	162899	5	5	.0067	D
3466.6	163657	1	3	.013	D
3472.6	162831	5	7	.017	D
3498.1	163038	3	5	.0051	D
3501.2	163013	3	3	.012	D
3510.7	162518	5	3	.0022	D
3515.2	162899	3	5	.0069	D
3520.5	164286	3	1	.093	D
3593.5	163709	3	5	.0099	D
3593.6	163708	3	3	.0066	D
3600.2	163657	3	3	.0043	D
3633.7	163401	3	1	.011	D
3682.2	163038	3	5	.0016	D
3685.7	163013	3	3	.0039	D
3701.2	162899	3	5	.0022	D
4536.3	170296	3	3	.0050	D
4702.5	169517	3	3	.0021	D
4708.9	169488	3	3	.042	D
4955.4	170296	3	3	.0033	D
5113.7	167808	3	3	.010	D
5120.5	170296	3	3	.0056	D
5154.4	169517	3	3	.019	D
5191.3	170296	3	3	.013	D
5326.4	167027	3	3	.0068	D
5333.3	169517	3	3	.0053	D
5341.1	166975	3	3	.11	D
5400.6	152971	3	1	.0090	B
5418.6	169488	3	3	.0052	D
5433.7	166657	3	3	.00283	B
5652.6	167808	3	3	.0089	D
5662.5	165913	3	3	.0069	D
5852.5	152971	3	1	.682	B
5868.4	167808	3	3	.014	D
5881.9	151038	5	3	.115	B
5913.6	167027	3	3	.048	D
5939.3	166657	5	3	.00200	B
5944.8	150859	5	5	.113	B
5961.6	167808	3	3	.033	D
5975.5	150772	5	3	.0351	B
6030.0	151038	3	3	.0561	B
6046.1	166657	3	3	.00226	B
6074.3	150917	3	1	.603	B
6096.2	150859	3	5	.181	B
6118.0	166657	5	3	.00609	B
6128.5	150772	3	3	.0067	B
6143.1	150316	5	5	.282	B
6150.3	167027	3	3	.015	D
6163.6	151038	1	3	.146	B
6217.3	150122	5	3	.0637	B
6266.5	150772	1	3	.249	B
6273.0	166975	3	3	.0097	D
6293.7	166657	3	3	.00639	B
6304.8	150316	3	5	.0416	B
6328.2	166657	5	3	.0339	B
6330.9	165913	3	3	.023	D
6334.4	149824	5	5	.161	B
6351.9	166657	1	3	.00345	B
6383.0	150122	3	3	.321	B
6401.1	166657	3	3	.0139	B
6402.2	149657	5	7	.0514	B
6506.5	149824	3	5	.300	B
6532.9	150122	1	3	.108	B
6599.0	151038	3	3	.232	B

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Ne I				
6602.9	165913	3	3	.0059	D
6652.1	150917	3	1	.0029	B
6678.3	150859	3	5	.233	B
6717.0	150772	3	3	.217	B
6721.1	165913	3	3	4.9 (-4)	D
6929.5	150316	3	5	.174	B
7024.1	150122	3	3	.0189	B
7032.4	148258	5	3	.253	B
7051.3	162436	3	3	.030	D
7059.1	162420	3	5	.068	C
7173.9	149824	3	5	.0287	B
7245.2	148258	3	3	.0935	B
7304.8	166657	1	3	.00255	B
7438.9	148258	1	3	.0231	B
7472.4	161637	3	3	.040	D
7535.8	161524	3	3	.43	D
7937.0	162420	5	5	.0078	C
8082.5	148258	3	3	.0012	B
8118.5	162436	3	3	.049	D
8128.9	162420	3	5	.0072	C
8259.4	162420	5	5	.0203	C
8571.4	162436	3	3	.055	D
8582.9	162420	3	5	.0100	C
8647.0	162420	5	5	.0391	C
8681.9	161637	3	3	.21	D
8767.5	161524	3	3	.0011	D
8771.7	162436	3	3	.16	D
8783.8	162420	3	5	.313	C
8865.3	159535	3	3	.0094	D
9201.8	161637	3	3	.091	D
9433.0	161637	3	3	.0011	D
9486.7	158796	3	3	.025	D
9534.2	161524	3	3	.063	D
10621.	159535	3	3	.0024	D
11409.	159535	3	3	.042	D
11525.	158796	3	3	.084	D
11767.	159535	3	3	.069	D
12459.	158796	3	3	.015	D
	Ne II				
357.03	280351	6	10*	38.	C
361.77	276677	6	2*	16.	C
406.28	246395	6	10*	18.	C
446.37	224291	6	6*	40.7	C
460.73	217048	4	2	47.	B
462.39	217048	2	2	23.	B
1907.5	276512	4	2	.28	D
1916.1	276277	4	4	.69	D
1930.0	276512	2	2	.57	D
1938.8	276277	2	4	.13	D
2858.0	281171	6	6	.79	D
2870.0	281026	6	6	.17	D
2873.0	280990	6	4	.38	D
2876.3	281171	4	6	.78	D
2876.5	280947	6	4	.33	D
2878.1	281333	2	2	.069	D
2888.4	281026	4	6	.070	D
2891.5	280990	4	4	.061	D
2897.0	280701	6	8	.052	D
2906.8	280990	2	4	.55	D
2910.1	280769	4	2	1.7	D
2910.4	280947	2	4	.59	D
2916.2	280474	6	4	.096	D
2925.6	280769	2	2	.56	D
2933.7	280269	6	6	.069	D
2955.7	252954	6	4	1.2	D
3001.7	252954	4	4	.87	D
3017.3	279325	6	4	.35	D
3027.0	279219	6	6	1.4	D
3028.7	279423	4	2	.85	D
3028.9	252954	2	4	.47	D
3034.5	279138	6	8	3.1	D
3037.7	279325	4	4	2.1	D
3045.6	279423	2	2	2.5	D
3047.6	279219	4	6	1.8	D
3054.7	279325	2	4	.94	D
3092.9	306687	6	6	1.3	D
3097.1	306688	8	8	1.3	D
3118.0	281171	8	6	.042	D
3134.1	306263	6	4	.26	D
3140.4	306243	8	6	.24	D
3151.1	281171	6	6	.048	D
3154.8	280797	8	6	.018	D
3164.4	280701	8	8	.16	D
3165.7	281026	6	6	.12	D
3173.6	280947	6	4	.045	D
3176.1	281171	4	6	.060	D
3187.6	251011	4	6	.014	D
3188.7	280797	6	6	.39	D
3190.9	281026	4	6	.15	D
3194.6	280990	4	4	.52	D
3198.6	280701	6	8	1.7	D
3198.9	280947	4	4	.23	D
3209.0	280262	8	8	.16	D
3209.4	280990	2	4	.60	D
3213.7	280947	2	4	1.7	D
3214.3	280797	4	6	2.2	D
3218.2	280173	8	10	3.6	D
3224.8	305365	6	8	3.5	D
3229.5	305365	8	8	.13	D
3229.6	305364	8	10	3.6	D
3230.1	277344	6	6	1.8	D
3230.4	277344	4	6	.14	D
3232.0	277326	6	4	.27	D
3232.4	277326	4	4	1.6	D
3243.4	280269	6	6	.23	D
3244.1	280262	6	8	1.5	D
3248.1	280474	4	4	.24	D
3255.4	281720	6	4	.038	D
3263.4	280474	2	4	.39	D
3269.9	280269	4	6	.51	D
3270.8	249696	6	4	.057	D
3297.7	249446	6	6	.43	D
3309.7	254292	4	2	.31	D
3310.5	281720	4	4	.069	D
3311.3	249840	4	2	.26	D
3314.7	281171	6	6	.044	D
3319.7	276512	4	2	1.6	D
3320.2	279219	8	6	.21	D
3323.7	254165	4	4	1.6	D
3327.2	249696	4	4	.91	D
3329.2	279138	8	8	.88	D
3330.7	281026	6	6	.039	D
3334.8	249109	6	8	1.8	D

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Ne II				
3336.1	306243	4	6	1.1	D
3344.4	249840	2	2	1.5	D
3345.5	276277	6	4	1.4	D
3345.8	276277	4	4	.22	D
3353.6	281333	4	2	.12	D
3355.0	249446	4	6	1.3	D
3356.3	280797	6	6	.20	D
3357.8	279219	6	6	.50	D
3360.3	306263	2	4	.86	D
3360.6	249696	2	4	.82	D
3362.9	279423	4	2	.35	D
3371.8	281171	4	6	.22	D
3374.1	279325	4	4	.30	D
3378.2	254292	2	2	1.7	D
3379.3	279423	2	2	.30	D
3386.2	279219	4	6	.055	D
3388.4	281026	4	6	2.2	D
3390.6	279325	2	4	.077	D
3392.8	254165	2	4	.44	D
3404.8	306687	4	6	1.9	D
3407.0	306688	6	8	2.3	D
3411.4	305582	4	2	.61	D
3413.2	305567	4	4	1.8	D
3414.9	280797	4	6	.018	D
3416.9	280269	6	6	.64	D
3417.7	280262	6	8	1.6	D
3438.9	305582	2	2	1.4	D
3440.7	305567	2	4	.35	D
3453.1	280474	4	4	.46	D
3454.8	306263	4	4	1.6	D
3456.6	281720	2	4	.96	D
3457.1	306243	4	6	.099	D
3459.3	306243	6	6	1.6	D
3475.2	281720	4	4	.012	D
3477.6	280269	4	6	.43	D
3481.9	252798	4	2	1.4	D
3503.6	281333	2	2	2.0	D
3522.7	281333	4	2	.023	D
3538.0	305582	4	2	.76	D
3539.9	305567	4	4	.036	D
3542.2	305567	6	4	.60	D
3542.9	281171	4	6	1.2	D
3546.2	280990	2	4	.063	D
3551.6	280947	2	4	.037	D
3557.8	252798	2	2	.19	D
3561.2	281026	4	6	.21	D
3565.8	280990	4	4	.62	D
3568.5	274409	6	8	1.4	D
3571.2	280947	4	4	.63	D
3574.2	274365	6	6	.10	D
3574.6	274365	4	6	1.3	D
3590.4	280797	4	6	.036	D
3594.2	280769	4	2	1.3	D
3612.3	280474	2	4	.26	D
3628.0	281720	4	4	.60	D
3632.7	280474	4	4	.13	D
3643.9	251522	4	4	.32	D
3644.9	281720	2	4	.99	D
3659.9	280269	4	6	.067	D
3664.1	246415	6	4	.70	D
3679.8	281333	4	2	.32	D
3694.2	246192	6	6	1.0	D
3697.1	281333	2	2	.28	D
3701.8	281171	4	6	.27	D
3709.6	246598	4	2	1.1	D
3713.1	251011	4	6	1.3	D
3721.8	281026	4	6	.20	D
3726.9	280990	4	4	.12	D
3727.1	251522	2	4	.98	D
3734.9	246415	4	4	.19	D
3744.6	280990	2	4	.26	D
3751.2	246598	2	2	.18	D
3753.8	280797	4	6	.45	D
3766.3	246192	4	6	.29	D
3777.1	246415	2	4	.42	D
3800.0	280474	4	4	.37	D
3818.4	280474	2	4	.61	D
3829.8	280269	4	6	.84	D
3942.3	249446	4	6	.010	D
	Ne V				
142.61	701945	9	9*	670.	C
143.32	698517	9	15*	1200.	C
147.13	709956	5	7	1500.	C
151.23	691540	5	5	338.	C
154.50	711210	1	3	700.	C
167.69	597083	9	9*	150.	C
358.93	279365	9	3*	210.	C
365.59	303812	5	3	135.	C
482.15	208161	9	9*	30.1	C
571.04	175876	9	15*	10.	C
2259.6	640868	3	5	1.9	D
2265.7	641646	5	7	2.4	D
	Ne VII				
97.502	1025600	1	3	1070.	B
115.46	978320	9	3*	480.	C
116.69	1071920	3	5	1600.	C
127.66	998280	3	1	190.	C
465.22	214952	1	3	40.9	B
558.61	290740	3	5	8.11	B
559.95	289850	1	3	10.7	B
561.38	289850	3	3	7.99	B
561.73	290740	5	5	23.9	B
562.99	289340	3	1	31.7	B
564.53	289850	5	3	13.1	B
	Ne VIII				
88.09	1135000	2	6*	840.	B
98.208	1147500	6	10*	2770.	B
770.41	129800	2	4	5.90	B
780.32	128150	2	2	5.69	B
2820.7	1135000	2	4	.720	B
2860.1	1135000	2	2	.688	B
	Nickel				
	Ni I				
1976.9	50790	7	9	1.1	C
1990.3	51125	5	7	.83	C
2007.0	50689	5	5	.17	C
2014.3	51344	3	5	.93	C
2026.6	49328	9	7	.24	C
2047.4	49033	7	7	.13	C
2055.5	50851	5	3	.33	C
2124.8	50458	5	3	.38	C

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Ni I				
2147.8	47425	5	3	.47	C
2158.3	46523	7	5	.69	C
2190.2	46523	5	5	.30	C
2197.4	47208	3	3	.78	C
2201.6	48818	5	3	.73	C
2244.5	45419	5	5	.38	C
2253.6	44565	7	7	.19	C
2258.2	44475	7	5	.17	C
2290.0	43655	9	7	2.1	C
2300.8	43655	7	7	.75	C
2303.0	45122	3	3	.45	C
2312.3	44565	7	7	5.5	C
2317.2	44475	7	5	3.8	C
2320.0	43090	9	11	6.9	C
2325.8	44315	7	9	3.5	C
2330.0	45122	5	3	5.3	C
2345.5	42621	9	7	2.2	C
2943.9	34163	7	5	.11	C
3012.0	36601	5	5	1.5	C
3037.9	33112	7	7	.32	C
3064.6	33501	5	7	.075	C
3080.8	34163	3	5	.093	C
3101.6	33112	5	7	.72	C
3101.9	35639	5	7	.49	C
3134.1	33611	3	5	.71	C
3225.0	34409	5	3	.11	C
3233.0	30923	9	11	.053	C
3271.1	31442	5	5	.0072	C
3315.7	31031	5	7	.053	C
3320.3	31442	7	5	.048	C
3361.6	30619	5	5	.045	C
3369.6	29669	9	7	.17	C
3380.6	32982	5	3	1.2	C
3393.0	29669	7	7	.24	C
3413.5	30619	7	5	.038	C
3414.8	29481	7	9	.55	C
3423.7	30913	3	3	.35	C
3433.6	29321	7	7	.17	C
3446.3	29889	5	5	.44	C
3452.9	29833	5	7	.098	C
3458.5	30619	3	5	.61	C
3461.7	29084	7	9	.27	C
3472.5	29669	5	7	.12	C
3483.8	30913	5	3	.14	C
3493.0	29501	5	3	.98	C
3510.3	30192	3	1	1.2	C
3515.1	29321	5	7	.44	C
3519.8	30619	5	5	.041	C
3524.5	28569	7	5	1.0	C
3566.4	31442	5	5	.56	C
3571.9	29321	7	7	.052	C
3597.7	29501	3	3	.14	C
3610.5	28569	5	5	.072	C
3619.4	31031	5	7	.73	C
3664.1	29501	5	3	.019	D
3807.1	29669	5	7	.043	C
3831.7	29501	5	3	.015	C
3858.3	29321	5	7	.069	C
4295.9	54251	9	7	.17	D
4401.6	48467	9	11	.38	D
4714.4	48467	13	11	.46	D
4786.5	48467	11	11	.18	D
4817.9	54251	7	7	.070	D
4838.7	54251	9	7	.22	D
4855.4	49159	5	5	.57	D
4980.2	49159	9	11	.19	D
5017.6	48467	11	11	.20	D
5080.5	49159	9	11	.32	D
5129.4	49159	7	5	.12	D
5371.3	54251	7	7	.16	D
5664.0	54251	5	7	.11	D
6176.8	49159	9	11	.047	D
6314.7	31442	5	5	.0057	D
6767.8	29501	1	3	.0033	D
7714.3	28569	5	5	.0014	D
	Ni II				
2053.3	57081	10	8	.041	D
2080.8	58706	4	4	.13	D
2090.1	58493	4	6	.11	D
2093.6	57081	8	8	.11	D
2125.1	56371	8	8	.10	D
2125.9	55418	10	8	.073	D
2128.6	57081	6	8	.40	D
2138.6	56075	8	6	.28	D
2158.7	56424	6	4	.57	D
2161.2	56371	6	8	.32	D
2165.6	54557	10	10	3.8	D
2169.1	55418	8	8	2.3	D
2174.7	55300	8	10	2.4	D
2175.2	56075	6	6	2.8	D
2184.6	56424	4	4	4.7	D
2188.1	55019	8	6	.090	D
2201.4	56075	4	6	2.1	D
2206.7	55418	6	8	2.5	D
2210.4	54557	8	10	.64	D
2216.5	53496	10	12	5.5	D
2220.4	68131	6	8	3.7	D
2223.0	53365	10	10	1.6	D
2224.4	58493	8	6	.51	D
2224.9	54263	8	8	2.5	D
2226.3	55019	6	6	2.0	D
2253.9	55019	4	6	3.2	D
2264.5	54263	6	8	2.4	D
2270.2	53365	8	10	2.5	D
2278.8	57420	8	6	4.5	D
2287.1	58706	6	4	4.5	D
2296.6	57081	8	8	3.2	D
2297.1	53635	6	4	4.6	D
2297.5	54176	4	2	5.3	D
2298.3	58493	6	6	4.5	D
2303.0	52738	8	6	4.7	D
2316.0	51558	10	8	4.9	D
2326.4	53635	4	4	1.0	D
2334.6	56371	8	8	1.3	D
2356.4	57420	6	6	.45	D
2367.4	51558	8	8	.13	D
2375.4	57081	6	8	1.1	D
2387.8	55418	8	8	.23	D
2394.5	55300	8	10	2.9	D
2413.0	56424	6	4	.13	D
2416.1	56371	6	8	3.3	D
2433.6	56075	6	6	.12	D
2437.9	54557	8	10	.87	D

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Ni II				
2510.9	53365	8	10	.94	D
2545.9	54263	6	8	.26	D
	Nitrogen				
	N I				
1163.9	105144	6	6	.43	D
1164.0	105144	4	6	.032	D
1164.2	105120	6	4	.048	D
1164.3	105120	4	4	.43	D
1167.4	104881	6	8	1.1	D
1168.4	104810	6	6	.095	D
1168.5	104810	4	6	1.3	D
1169.7	104717	6	8	.030	D
1176.5	104222	6	4	.95	D
1176.6	104222	4	4	.11	D
1177.7	104145	4	2	1.3	D
1199.6	83365	4	6	5.5	D
1200.2	83318	4	4	5.3	D
1200.7	83284	4	2	5.5	D
1310.5	105144	4	6	1.3	D
1316.3	104810	4	6	.025	D
1492.6	86221	6	4	5.3	D
1492.8	86221	4	4	.58	D
1494.7	86137	4	2	5.0	D
4099.9	110521	2	4	.034	D
4110.0	110545	4	6	.040	D
4114.0	110521	4	4	.0068	D
4137.6	107446	2	4	.0039	D
4143.4	107446	4	4	.0078	D
4151.5	107446	6	4	.013	D
4214.8	107037	4	6	.022	D
4216.1	106996	2	4	.031	D
4218.9	106980	2	2	.012	D
4222.1	106996	4	4	.0098	D
4223.1	107037	6	6	.051	D
4224.9	106980	4	2	.061	D
4230.5	106996	6	4	.033	D
4385.5	120566	2	2	.0052	C
4392.4	120566	4	2	.0102	C
4914.9	106478	2	2	.00759	B
4935.1	106478	4	2	.0158	B
5169.6	107446	6	4	.00209	C
5181.4	107446	4	4	.00144	C
5186.6	107446	2	4	7.3 (-4)	C
5199.8	112808	2	2	.023	D
5201.6	112801	2	4	.023	D
5281.2	107037	6	6	.00282	C
5292.7	106996	6	4	.00167	C
5293.5	107037	4	6	.00113	C
5309.4	106980	4	2	.00273	C
5310.5	106996	2	4	.00137	C
5344.0	106814	6	6	6.2 (-4)	C
5356.6	106814	4	6	.00189	C
5367.0	106778	4	4	.00118	C
5372.6	106778	2	4	.00107	C
5378.3	106759	2	2	.00210	C
5816.5	112681	4	6	.00278	C
5829.5	112681	6	6	.0064	C
5834.6	112610	2	4	.00383	C
5840.9	112610	4	4	.00122	C
5849.7	112565	2	2	.00152	C
5854.0	112610	6	4	.00409	C
5856.0	112565	4	2	.0076	C
6606.2	109927	4	6	7.9 (-4)	C
6622.5	109927	6	6	.0071	C
6627.0	109857	2	4	.00197	C
6636.9	109857	4	4	.0125	C
6645.0	109927	8	6	.0311	C
6646.5	109812	2	2	.0194	C
6653.5	109857	6	4	.0244	C
6656.5	109812	4	2	.0193	C
6926.7	109927	4	6	.0064	C
6945.2	109927	6	6	.0149	C
6951.6	109857	2	4	.0088	C
6960.5	109857	4	4	.00281	C
6973.1	109812	2	2	.00350	C
6979.2	109857	6	4	.0094	C
6982.0	109812	4	2	.0174	C
7423.6	96751	2	4	.052	C
7442.3	96751	4	4	.106	C
7468.3	96751	6	4	.161	C
	N II				
474.89	210705	5	5	4.5	D
475.65	210240	1	3	14.	D
475.70	210266	3	5	20.	D
475.76	210240	3	3	11.	D
475.80	210302	5	7	26.	D
475.88	210266	5	5	6.8	D
508.70	196712	5	5	2.8	D
510.76	211104	5	7	31.	D
513.85	209926	5	5	6.8	D
529.36	188909	1	3	6.5	D
529.41	188937	3	1	20.	D
529.49	188909	3	3	4.9	D
529.64	188857	3	5	4.9	D
529.72	188909	5	3	8.1	D
529.87	188857	5	5	15.	D
533.51	187438	1	3	20.	D
533.58	187462	3	5	27.	D
533.65	187438	3	3	15.	D
533.73	187492	5	7	36.	D
533.82	187462	5	5	9.1	D
547.82	197859	5	3	5.2	D
559.76	211336	1	3	12.	D
574.65	189335	5	7	35.	D
582.16	187091	5	5	13.	D
635.20	190120	1	3	18.	D
644.63	155127	1	3	12.	C
644.84	155127	3	3	35.	C
645.18	155127	5	3	58.	C
660.29	166766	5	3	40.	C
671.02	149077	3	5	2.9	D
671.39	149077	5	5	8.9	D
671.41	148940	1	3	3.6	D
671.63	148940	3	3	2.7	D
671.77	148909	3	1	12.	D
672.00	148940	5	3	4.4	D
745.84	166766	1	3	10.	C
746.98	149188	5	3	40.	C
748.37	148940	5	3	2.0	D
775.97	144188	5	5	35.	C
915.61	109217	1	3	3.6	C
915.96	109224	3	1	11.	C

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	N II				
1084.0	92252	1	3	2.0	C
1085.5	92250	5	5	.90	C
1085.7	92237	5	7	3.6	C
2139.5	211336	3	3	.29	D
3593.6	196712	3	5	.24	D
3609.1	196592	3	3	.24	D
3615.9	196540	3	1	.24	D
3829.8	196712	3	5	.15	D
3838.4	196712	5	5	.45	D
3842.2	196592	1	3	.20	D
3847.4	196592	3	3	.15	D
3855.1	196540	3	1	.60	D
3856.1	196592	5	3	.25	D
3919.0	190120	3	3	1.00	C
3995.0	174212	3	5	1.3	D
4114.4	188909	3	3	.0019	D
4447.0	187091	3	5	1.30	C
4477.7	188909	5	3	.035	D
4507.6	188857	7	5	.038	D
4601.5	170666	3	5	.270	C
4607.2	170608	1	3	.340	C
4613.9	170608	3	3	.196	C
4621.4	170573	3	1	.90	C
4630.5	170666	5	5	.84	C
4643.1	170608	5	3	.466	C
4774.2	187462	3	5	.054	C
4779.7	187438	3	3	.269	C
4781.2	187492	5	7	.040	C
4788.1	187462	5	5	.248	C
4793.7	187438	5	3	.089	C
4803.3	187492	7	7	.313	C
4810.3	187462	7	5	.055	C
4987.4	188937	3	1	.63	C
4994.4	188909	3	3	.74	C
5001.1	186512	3	5	1.02	C
5001.5	186571	5	7	1.08	C
5002.7	168892	1	3	.085	C
5005.2	186652	7	9	1.22	C
5007.3	188857	3	5	.77	C
5010.6	168892	3	3	.268	C
5025.7	186571	7	7	.134	C
5040.7	186512	7	5	.0053	C
5045.1	168892	5	3	.410	C
5452.1	188909	1	3	.14	D
5454.2	188937	3	1	.41	D
5462.6	188909	3	3	.10	D
5478.1	188857	3	5	.10	D
5480.1	188909	5	3	.17	D
5495.7	188857	5	5	.30	D
5666.6	166582	3	5	.423	C
5676.0	166522	1	3	.310	C
5679.6	166679	5	7	.56	C
5686.2	166522	3	3	.231	C
5710.8	166582	5	5	.137	C
5927.8	187438	1	3	.315	C
5931.8	187462	3	5	.425	C
5940.2	187438	3	3	.235	C
5941.7	187492	5	7	.56	C
5952.4	187462	5	5	.140	C
6482.1	164611	3	3	.37	D
6610.6	189335	5	7	.59	D

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	N III				
374.20	267238	2	4	101.	C
451.87	221302	2	2	8.9	C
452.23	221302	4	2	17.8	C
685.00	145986	2	4	9.3	C
685.51	145876	2	2	37.1	C
685.82	145986	4	4	46.8	C
686.34	145876	4	2	19.0	C
763.34	131004	2	2	9.6	C
764.36	131004	4	2	18.7	C
771.54	186797	2	4	8.2	C
771.90	186797	4	4	16.5	C
772.39	186797	6	4	24.7	C
772.89	230409	6	4	20.3	C
772.98	230404	4	2	22.7	C
979.84	203089	4	4	8.9	C
979.92	203075	6	6	9.3	C
989.79	101031	2	4	4.15	C
991.51	101031	4	4	.82	C
991.58	101024	4	6	4.96	C
1747.8	203089	2	4	1.31	C
1751.2	203089	4	4	.258	C
1751.7	203075	4	6	1.57	C
4097.3	245701	2	4	.82	C
4103.4	245665	2	2	.82	C
4634.1	267238	2	4	.65	C
4640.6	267244	4	6	.78	C
4641.9	267238	4	4	.130	C
	N IV				
247.20	404522	1	3	114.	C
283.52	420053	9	15*	290.	C
322.64	377285	9	3*	84.	C
335.05	429160	3	5	185.	C
387.35	388855	3	1	28.	D
765.15	130694	1	3	24.0	B
923.16	175669	9	9*	18.	B
955.34	235369	3	1	30.	C
1718.6	188883	3	5	2.37	C
3480.8	406005	3	9*	1.1	C
4057.8	429160	3	5	.68	C
6380.8	404522	1	3	.14	B
7116.7	420053	9	15*	.12	C
	N V				
209.29	477817	2	6*	118.	B
247.66	484418	6	10*	430.	C
1238.8	80722	2	4	3.41	B
1242.8	80463	2	2	3.38	B
4603.7	477842	2	4	.412	B
4620.0	477766	2	2	.408	B
	N VI				
24.898	4016390	1	3	5158.	AA
28.787	3473840	1	3	180.9(+2)	AA
161.22	4006180	3	9*	285.9	AA
173.29	4016390	1	3	269.7	AA
173.92	4013460	9	15*	876.	A
185.19	4013820	3	5	824.	A
1901.5	3438490	3	9*	.6777	AA
2896.4	3473840	1	3	.2080	AA

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Oxygen				
	O I				
1028.2	97488	1	3	.20	D
1152.2	102662	5	5	5.5	D
1217.6	115918	1	3	1.8	C
1302.2	76795	5	3	3.3	C
1304.9	76795	3	3	2.0	C
1306.0	76795	1	3	.66	C
5435.2	105019	3	5	.0061	C
5435.8	105019	5	5	.0102	C
5436.9	105019	7	5	.0142	C
6453.6	102117	3	5	.0142	B
6454.4	102117	5	5	.0237	B
6456.0	102117	7	5	.0331	B
6653.8	130943	3	1	.600	B
7156.7	116631	5	5	.473	B
7471.4	127292	5	3	.0114	B
7473.2	127288	5	5	.102	B
7476.4	127283	5	7	.408	B
7477.2	127292	3	3	.170	B
7479.1	127288	3	5	.306	B
7480.7	127292	1	3	.226	B
7771.9	86631	5	7	.340	B
7774.2	86628	5	5	.340	B
7775.4	86626	5	3	.340	B
7886.3	128595	3	5	.370	B
7939.5	113727	7	5	.00165	C
7943.2	113721	7	7	.0417	C
7947.2	113727	5	5	.058	C
7947.6	113714	7	9	.373	C
7950.8	113721	5	7	.331	C
7952.2	113727	3	5	.313	C
7981.9	101155	3	3	.12	D
7982.4	101155	1	3	.16	D
7987.0	101148	3	5	.21	D
7987.3	101148	5	5	.072	D
7995.1	101135	5	7	.29	D
	O II				
429.92	232603	4	2	39.	D
430.04	232536	4	4	39.	D
430.18	232463	4	6	39.	D
483.75	233544	4	2	.84	D
483.98	233430	6	4	.76	D
484.03	233430	4	4	.084	D
485.09	232959	6	8	25.	D
485.47	232796	6	6	1.6	D
485.52	232796	4	6	23.	D
3007.1	265999	8	10	.84	C
3007.7	265985	6	8	.72	C
3013.4	265639	6	8	.74	C
3032.1	265930	8	10	.85	C
3032.5	265763	6	8	.82	C
3134.8	238893	8	6	1.23	C
3273.5	259286	8	6	1.14	C
3377.2	233544	2	2	1.88	C
3390.3	233430	2	4	1.86	C
3407.4	259286	6	6	.75	C
3749.5	212162	6	4	.90	C
3882.2	232754	8	8	.493	C
3912.0	232527	6	4	1.27	C
3919.3	232480	4	2	1.40	C
3973.3	214229	4	4	1.27	C
4069.6	231296	2	4	1.39	C
4069.9	231350	4	6	1.49	C
4072.2	231428	6	8	1.70	C
4075.9	231530	8	10	1.98	C
4085.1	231350	6	6	.478	C
4087.2	255756	4	6	2.24	C
4089.3	255978	10	12	2.62	C
4095.6	255759	6	8	2.23	C
4097.2	255828	8	10	2.37	C
4104.7	232748	4	6	1.04	C
4105.0	232746	4	4	.80	C
4108.8	255759	8	8	.349	C
4119.2	232754	6	8	1.48	C
4120.3	232748	6	6	.443	C
4132.8	232536	2	4	.84	C
4153.3	232463	4	6	.77	C
4276.7	256123	6	8	1.82	C
4277.4	256084	2	4	1.49	C
4277.9	256123	8	8	.302	C
4281.4	255813	6	6	.60	C
4282.8	255913	4	4	1.06	C
4283.0	256088	4	6	1.58	C
4283.1	256088	6	6	.51	C
4283.8	256084	4	4	.59	C
4294.8	255813	4	6	1.39	C
4303.8	255691	6	8	1.97	C
4328.6	255622	4	2	1.21	C
4340.4	255829	6	8	2.23	C
4347.4	229968	4	4	.94	C
4349.4	208484	6	6	.74	C
4351.3	229947	6	6	.97	C
4396.0	234454	6	6	.398	C
4414.9	211713	4	6	1.15	C
4417.0	211522	2	4	.95	C
4443.1	251224	6	6	.57	C
4448.2	251221	8	8	.57	C
4489.5	255812	2	4	1.51	C
4491.3	255690	4	6	1.81	C
4596.2	228723	4	6	1.03	C
4602.1	256126	4	6	1.70	C
4609.4	256143	6	8	1.82	C
4641.8	206878	4	6	.79	C
4661.6	206786	4	4	.52	C
4701.2	253792	4	4	.87	C
4703.2	251224	4	6	.82	C
4705.4	232959	6	8	1.38	C
4871.6	253048	4	6	.435	C
4906.9	232536	4	4	.68	C
4924.6	232463	4	6	.67	C
4941.1	234402	2	4	.83	C
4943.1	234454	4	6	1.06	C
5206.7	233430	4	4	.391	C
6627.6	248514	4	4	.089	C
6666.9	248425	4	2	.0349	C
6678.2	248514	2	4	.0173	C
6718.1	248425	2	2	.068	C
6721.4	203942	4	2	.189	C
6810.6	246029	6	8	.00180	C
6844.1	245903	4	6	.00325	C
6847.0	246029	8	8	.0347	C
6869.7	245903	6	6	.059	C
6885.1	245816	4	4	.067	C
6895.3	246029	10	8	.298	C

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	O II				
6906.5	245903	8	6	.272	C
6908.1	245768	4	2	.332	C
6910.8	245816	6	4	.267	C
	O III				
262.88	380706	5	5	40.	D
263.69	379232	1	3	52.	D
263.73	379293	3	5	73.	D
263.77	379232	3	3	40.	D
263.82	379356	5	7	96.	D
263.86	379293	5	5	24.	D
277.38	380782	5	7	110.	D
279.79	377687	5	5	26.	D
295.94	381086	1	3	48.	D
303.41	329582	1	3	34.	D
303.46	329643	3	1	100.	D
303.52	329582	3	3	26.	D
303.62	329468	3	5	25.	D
303.69	329582	5	3	42.	D
303.80	329468	5	5	76.	D
305.60	327228	1	3	100.	D
305.66	327277	3	5	140.	D
305.70	327228	3	3	76.	D
305.77	327351	5	7	180.	D
305.84	327277	5	5	46.	D
320.98	331820	5	7	190.	D
328.45	324734	5	5	61.	D
345.31	332777	1	3	99.	D
374.08	267633	5	5	26.	D
395.56	273080	5	3	49.	D
507.39	197087	1	3	16.	C
507.68	197087	3	3	47.	C
508.18	197087	5	3	79.	C
525.80	210459	5	3	88.	C
597.82	210459	1	3	18.	C
599.60	187049	5	5	55.	C
702.33	142383	1	3	5.7	C
702.82	142397	3	1	17.	C
832.93	120059	1	3	3.2	C
835.10	120053	5	5	1.4	C
835.29	120025	5	7	5.7	C
1109.5	381086	3	3	2.8	D
1679.1	357111	3	5	.94	D
1686.9	356838	3	3	.94	D
1760.4	357111	3	5	.60	D
1764.5	357111	5	5	1.8	D
1766.3	356838	1	3	.78	D
1772.3	356732	3	1	2.3	D
1773.0	356838	5	3	.98	D
2390.4	332777	3	3	2.2	D
2959.7	324734	3	5	2.1	D
2996.5	327228	3	3	.51	D
3004.4	327277	5	5	.47	D
3017.6	327351	7	7	.59	D
3115.7	329643	3	1	1.5	D
3121.7	329582	3	3	1.5	D
3132.9	329468	3	5	1.4	D
3261.0	324658	5	7	1.8	D
3265.5	324836	7	9	2.1	D
3267.3	324462	3	5	1.7	D
3281.9	324462	5	5	.32	D
3284.6	324658	7	7	.23	D
3405.7	329582	1	3	.27	D
3408.1	329643	3	1	.81	D
3415.3	329582	3	3	.20	D
3428.7	329468	3	5	.20	D
3430.6	329582	5	3	.33	D
3444.1	329468	5	5	.59	D
3702.8	327228	1	3	.62	D
3707.2	327277	3	5	.83	D
3714.0	327228	3	3	.46	D
3715.1	327351	5	7	1.1	D
3725.3	327277	5	5	.27	D
3961.6	331820	5	7	1.3	D
5268.1	332777	1	3	.31	D
5508.1	324734	5	5	.11	D
5592.4	290957	3	3	.36	D
	O IV				
238.36	419534	2	4	288.	C
238.57	419551	4	6	346.	C
238.58	419534	4	4	58.	C
279.63	357614	2	2	23.7	C
279.94	357614	4	2	47.7	C
553.33	180724	2	4	12.0	C
554.08	180481	2	2	47.3	C
554.51	180724	4	4	60.	C
555.26	180481	4	2	25.0	C
608.40	164366	2	2	12.5	C
609.83	164366	4	2	23.6	C
616.95	289024	6	4	25.5	C
617.01	289024	4	4	2.93	C
617.04	289015	4	2	28.6	C
624.62	231538	2	4	10.7	C
625.13	231538	4	4	21.5	C
625.85	231538	6	4	32.2	C
779.73	255185	6	4	1.53	C
779.82	255185	4	4	13.1	C
779.91	255156	6	6	13.7	C
780.00	255156	4	6	1.0	C
787.71	126950	2	4	5.9	C
790.11	126950	4	4	1.15	C
790.20	126936	4	6	7.1	C
921.30	289024	2	4	2.11	C
921.37	289015	2	2	9.2	C
923.37	289024	4	4	11.4	C
923.43	289015	4	2	4.48	C
1338.6	255185	2	4	2.22	C
1343.0	255185	4	4	.428	C
1343.5	255156	4	6	2.64	C
	O V				
172.17	580825	1	3	296.	B
192.85	600766	9	15*	690.	B
215.17	546973	9	3*	170.	C
220.35	612616	3	5	440.	C
248.46	561276	3	1	65.	D
629.73	158798	1	3	28.0	B
758.68	213887	3	5	5.68	B
759.44	213618	1	3	7.55	B
760.23	213618	3	3	5.64	B
760.45	213887	5	5	16.9	B
761.13	213463	3	1	22.5	B
762.00	213618	5	3	9.34	B
774.52	287910	3	1	35.4	C

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	O V				
1371.3	231721	3	5	3.29	C
2784.0	582882	3	9*	1.6	D
3144.7	612616	3	5	.93	C
5114.1	580825	1	3	.17	B
5589.9	600766	9	15*	.15	C
	O VI				
150.10	666218	2	6*	254.	B
173.03	674656	6	10*	885.	B
1031.9	96908	2	4	4.15	B
1037.6	96375	2	2	4.08	B
3811.4	666270	2	4	.513	B
3834.2	666113	2	2	.505	B
	O VII				
18.627	5368550	1	3	9362.	AA
21.602	4629200	1	3	330.9(+2)	AA
120.33	5355670	3	9*	533.5	AA
128.20	5368550	1	3	505.3	AA
128.46	5364420	9	15*	1620.	A
135.82	5365470	3	5	1530.	A
1630.2	4585980	3	9*	.7935	AA
2450.0	4629200	1	3	.2514	AA
	Phosphorus				
	P I				
1671.7	59820	4	2	.39	D
1674.6	59716	4	4	.40	D
1679.7	59535	4	6	.39	D
1775.0	56340	4	6	2.17	C
1782.9	56090	4	4	2.14	C
1787.7	55939	4	2	2.13	C
2135.5	58174	4	4	.211	C
2136.2	58174	6	4	2.83	C
2149.1	57877	4	2	3.18	C
2152.9	65156	2	4	.485	C
2154.1	65156	4	4	.173	C
2154.1	65157	4	6	.58	C
2534.0	58174	2	4	.200	C
2535.6	58174	4	4	.95	C
2553.3	57877	2	2	.71	C
2554.9	57877	4	2	.300	C
	P II				
1301.9	76813	1	3	.50	C
1304.5	76824	3	1	1.5	C
1304.7	76813	3	3	.37	C
1305.5	76765	3	5	.38	C
1309.9	76813	5	3	.62	C
1310.7	76765	5	5	1.1	C
4475.3	127889	5	7	1.3	D
4499.2	130143	5	7	1.4	D
4530.8	127368	3	5	1.0	D
4554.8	127951	3	5	.96	D
4588.0	125130	5	7	1.7	D
4589.9	124948	3	5	1.6	D
4602.1	125392	7	9	1.9	D
4943.5	123892	7	5	.63	D
5253.5	107924	3	5	1.0	D
5425.9	105550	5	5	.69	D
6024.2	103340	3	5	.51	D
6043.1	103669	5	7	.68	D
	P III				
1334.8	74917	2	4	.55	D
1344.3	74946	4	6	.64	D
1344.8	74917	4	4	.11	D
4057.4	141514	4	4	.10	D
4059.3	141514	6	4	.90	D
4080.1	141377	4	2	.99	D
	Potassium				
	K I				
4044.1	24720	2	4	.0124	C
4047.2	24701	2	2	.0124	C
5084.2	32648	2	2	.00350	C
5099.2	32648	4	2	.0070	C
5323.3	31765	2	2	.0063	C
5339.7	31765	4	2	.0126	C
5343.0	31696	2	4	.0040	D
5359.6	31696	4	6	.0046	D
5782.4	30274	2	2	.0123	C
5801.8	30274	4	2	.0246	C
5812.2	30186	2	4	.0028	D
5831.9	30185	4	6	.0032	D
6911.1	27451	2	2	.0272	C
6938.8	27451	4	2	.054	C
7664.9	13043	2	4	.387	B
7699.0	12985	2	2	.382	B
	K II				
607.93	164496	1	3	.013	D
	K III				
2550.0	246626	6	4	2.0	D
2635.1	246626	4	4	1.2	D
2992.4	240830	6	8	2.5	D
3052.1	241444	4	6	1.7	D
3202.0	243947	4	4	1.8	D
3289.1	243121	4	6	2.0	D
3322.4	237512	6	6	1.3	D
3421.8	243448	2	4	1.5	D
	K XVI				
206.27	484800	1	3	94.	C
	K XVII				
22.020	4814800	2	4	4.7 (+4)	C
22.163	4818000	4	6	5.6 (+4)	C
22.18	4814800	4	4	9300.	C
22.60	4699000	2	2	2500.	D
22.76	4699000	4	2	4700.	C
	Praseodymium				
	Pr II				
3997.0	28010	15	15	.187	C
4062.8	28010	13	15	1.00	C
4100.7	28816	17	19	.84	C
4143.1	27128	15	17	.58	C
4179.4	25569	13	15	.52	C
4222.9	24116	11	13	.391	C
4241.0	28010	17	15	.230	C
4359.8	28010	15	15	.11	D
4405.8	27128	17	17	.090	D
4429.3	25569	15	15	.228	C
4449.8	24116	13	13	.124	C
4468.7	24116	11	13	.154	C
4510.2	25569	13	15	.116	C

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Pr II				
4534.2	27128	15	17	.049	D
4734.2	24116	15	13	.025	D
4879.1	25569	15	15	.018	D
4886.0	25569	15	15	.013	D
4912.6	28010	17	15	.057	D
5034.4	28816	19	19	.11	D
5110.8	28816	21	19	.278	C
5135.1	27128	17	17	.125	C
5173.9	27128	19	17	.318	C
5219.1	25569	15	15	.095	D
5220.1	25569	17	15	.235	C
5251.7	24116	15	13	.011	D
5259.7	24116	15	13	.224	C
5292.6	24116	13	13	.093	D
5810.6	28816	17	19	.023	D
5879.3	28010	15	15	.076	D
6200.8	27128	15	17	.018	D
6278.7	25569	13	15	.026	D
6398.0	24116	11	13	.019	D
	Rubidium				
	Rb I				
3022.5	33076	2	4	4.13(-5)	C
3032.0	32972	2	4	4.93(-5)	C
3044.2	32840	2	4	8.2 (-5)	C
3060.2	32668	2	4	1.05(-4)	C
3082.0	32437	2	4	1.49(-4)	C
3112.6	32119	2	4	2.5 (-4)	C
3113.1	32114	2	2	1.3 (-4)	C
3157.5	31661	2	4	3.38(-4)	C
3158.3	31654	2	2	2.0 (-4)	C
3228.0	30970	2	4	6.4 (-4)	C
3229.2	30959	2	2	3.8 (-4)	C
3348.7	29854	2	4	.00137	C
3350.8	29835	2	2	8.9 (-4)	C
3587.1	27870	2	4	.00397	C
3591.6	27835	2	2	.0029	C
4201.8	23793	2	4	.018	C
4215.5	23715	2	2	.015	C
7800.3	12817	2	4	.370	B
7947.6	12579	2	2	.340	B
	Scandium				
	Sc I				
2113.5	47315	4	6	.032	C
2263.0	44189	4	4	.058	C
2267.3	44105	4	2	.48	C
2271.6	44189	6	4	.46	C
2335.4	42819	4	2	.17	C
2346.8	42780	6	4	.13	C
2439.4	41163	6	6	.21	C
2439.9	41153	6	4	.022	C
2711.4	37040	6	6	.29	C
2739.8	36666	6	6	.0056	C
2974.0	33615	4	4	.45	C
2980.8	33707	6	6	.44	C
3015.4	33154	4	6	.66	C
3019.3	33278	6	8	.81	C
3269.9	30573	4	2	3.1	C
3273.6	30707	6	4	2.7	C
3907.5	25585	4	6	1.28	C
3911.8	25725	6	8	1.37	C
	Sc I				
4020.4	24866	4	4	1.65	C
4023.7	25014	6	6	1.44	C
4753.2	21033	4	6	.010	C
4779.4	21086	6	8	.0084	C
4791.5	21033	6	6	.0023	C
5301.9	18856	4	4	.0013	C
5343.0	18711	4	2	.0051	C
5349.7	18856	6	4	.0040	C
6210.7	16097	4	4	.012	C
6239.8	16022	4	4	.0065	C
6305.7	16023	6	6	.015	C
6378.8	15673	4	4	.0016	C
6448.1	15673	6	4	2.6 (-4)	C
	Sc II				
2273.1	55716	1	3	7.7	D
3353.7	32350	5	7	2.0	D
3372.2	29824	7	5	1.2	D
3535.7	30816	5	3	.83	D
3572.5	28161	7	7	1.8	D
3576.4	28021	5	5	1.4	D
3613.8	27841	7	9	1.9	D
3630.8	27602	5	7	1.6	D
3642.8	27444	3	5	1.5	D
4246.8	26081	5	5	1.5	D
4314.1	28161	9	7	.41	D
4374.5	27841	9	9	.14	D
4670.4	32350	5	7	.18	D
5031.0	30816	5	3	.49	D
5239.8	30816	1	3	.14	D
5526.8	32350	9	7	.42	D
5657.9	29824	5	5	.13	D
	Silicon				
	Si I				
1977.6	50566	1	3	.18	D
1979.2	50602	3	1	.51	D
1980.6	50566	3	3	.13	D
1983.2	50500	3	5	.14	D
1986.4	50566	5	3	.21	D
1989.0	50500	5	5	.41	D
2208.0	45276	1	3	.311	C
2210.9	45294	3	5	.416	C
2211.7	45276	3	3	.232	C
2216.7	45322	5	7	.55	C
2218.1	45294	5	5	.138	C
2506.9	39955	3	5	.466	C
2514.3	39760	1	3	.61	C
2516.1	39955	5	5	1.21	C
2519.2	39760	3	3	.456	C
2524.1	39683	3	1	1.81	C
2528.5	39760	5	3	.77	C
2532.4	54871	1	3	.26	D
2631.3	53387	1	3	.97	D
2881.6	40992	5	3	1.89	C
3905.5	40992	1	3	.118	C
4738.8	60857	3	3	.010	D
4783.0	60857	5	3	.017	D
4792.3	60816	5	5	.017	D
4818.1	60705	5	7	.011	D
4821.2	60496	3	5	.0080	D
4947.6	61198	3	1	.042	D

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Si I				
5006.1	60962	3	5	.028	D
5622.2	57542	3	3	.016	D
5690.4	57329	3	3	.012	D
5708.4	57468	5	5	.014	D
5754.2	57329	5	3	.015	D
5772.1	58312	3	1	.036	D
5948.5	57798	3	5	.022	D
7226.2	59111	3	5	.0079	D
7405.8	58775	3	5	.037	D
7409.1	58787	5	7	.023	D
7680.3	60301	3	5	.046	D
7918.4	60645	3	5	.052	D
7932.3	60705	5	7	.051	D
7944.0	60849	7	9	.058	D
7970.3	60645	5	5	.0071	D
	Si II				
989.87	101023	2	4	6.7	D
992.68	101025	4	6	8.0	D
1020.7	97972	2	2	1.3	D
1190.4	84005	2	4	6.9	D
1193.3	83802	2	2	28.	D
1194.5	84005	4	4	36.	D
1197.4	83802	4	2	14.	D
1248.4	123034	4	4	13.	D
1251.2	123034	6	4	19.	D
1260.4	79339	2	4	20.	D
1264.7	79355	4	6	23.	D
1304.4	76666	2	2	3.6	D
1309.3	76666	4	2	7.0	D
1526.7	65501	2	2	3.73	C
1533.5	65501	4	2	7.4	C
1808.0	55310	2	4	.037	D
2904.3	113761	4	6	.67	D
2905.7	113760	6	8	.71	D
3210.0	112395	4	6	.46	D
4128.1	103556	4	6	1.32	C
4130.9	103556	6	8	1.42	C
5041.0	101023	2	4	.98	D
5056.0	101025	4	6	1.2	D
5957.6	97972	2	2	.42	D
5978.9	97972	4	2	.81	D
6347.1	81252	2	4	.70	C
6371.4	81192	2	2	.69	C
7848.8	113761	4	6	.39	D
7849.7	113760	6	8	.42	D
	Si III				
883.40	235414	5	7	63.	D
994.79	153377	3	3	7.89	B
997.39	153377	5	3	13.1	B
1141.6	217440	3	5	30.	D
1144.3	217489	5	7	39.	D
1161.6	216190	5	5	16.	D
1206.5	82884	1	3	25.9	B
1206.5	165765	3	5	48.9	B
1207.5	205029	5	5	19.	D
1294.5	130101	3	5	5.42	B
1296.7	129842	1	3	7.19	B
1298.9	129842	3	3	5.36	B
1299.0	130101	5	5	16.1	B
1301.2	129708	3	1	21.3	B
1303.3	129842	5	3	8.85	B

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Si III				
1328.8	228700	1	3	27.	D
1417.2	153444	3	1	26.0	C
1435.8	235414	5	7	21.	D
1589.0	228700	5	3	11.	D
1778.7	199164	7	9	4.4	D
1783.1	199026	5	7	3.8	D
3241.6	206176	5	3	2.3	D
3486.9	230270	15	21*	1.8	D
3590.5	204331	3	5	3.9	D
4552.6	175336	3	5	1.26	C
4554.0	248773	5	3	.76	D
4567.8	175263	3	3	1.25	C
4683.0	248168	5	5	.95	D
4716.7	225526	5	7	2.8	D
5451.5	244866	3	5	.60	D
5473.1	245087	5	7	.79	D
5716.3	227089	9	7	.19	D
5739.7	176487	1	3	.47	D
7462.6	214995	5	3	.49	D
7466.3	214989	7	5	.54	D
7612.4	227665	3	5	1.1	D
	Si IV				
457.82	218429	2	4	3.6	D
458.16	218267	2	2	3.6	D
515.12	265418	2	2	4.1	D
516.35	265418	4	2	8.2	D
560.50	250008	6	10*	1.0	D
749.94	293719	10	14*	14.5	C
815.05	193979	2	2	12.3	C
818.13	193979	4	2	24.4	C
860.74	276554	10	6*	1.8	D
1066.6	254128	10	14*	39.1	C
1122.5	160376	2	4	20.5	C
1128.3	160376	4	4	4.03	C
1128.3	160374	4	6	24.2	C
1393.8	71749	2	4	7.73	B
1402.8	71288	2	2	7.58	B
1724.1	218375	10	6*	5.5	C
	Si V				
96.439	1036915	1	3	480.	D
97.143	1029407	1	3	2000.	D
117.86	848511	1	3	300.	D
	Si VI				
246.00	406497	4	2	170.	C
249.12	406497	2	2	85.	C
	Si VII				
217.83	506080	5	3	430.	D
272.64	366780	5	3	51.	C
274.18	368760	3	1	120.	C
275.35	363170	5	5	89.	C
275.67	366780	3	3	30.	C
276.84	366780	1	3	39.	C
278.45	363170	3	5	29.	C
	Si VIII				
214.76	534810	4	2	410.	D
216.92	530420	6	4	360.	D
232.86	534810	2	2	80.	D
235.56	530420	4	4	97.	D
250.45	504630	2	2	77.	D

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Si VIII				
250.79	504630	4	2	160.	D
314.31	318160	4	2	52.	D
316.20	316250	4	4	50.	D
319.83	312670	4	6	49.	D
	Si IX				
223.73	446967	1	3	42.	C
225.03	446967	3	3	120.	C
227.01	446967	5	3	200.	C
227.30	492890	5	3	230.	D
258.10	440390	5	5	104.	C
294.37	344100	9	9*	59.	C
347.36	292301	9	15*	22.	C
	Si X				
253.77	394040	2	4	29.	C
256.57	390050	2	2	110.	C
258.35	394040	4	4	140.	C
261.05	390050	4	2	54.	C
272.00	367670	2	2	30.	C
277.26	367670	4	2	57.	C
287.08	510300	2	4	26.	C
289.19	510300	4	4	50.	C
292.22	510300	6	4	73.	C
347.73	575450	10	10*	43.	D
353.09	287870	6	10*	21.	C
	Si XI				
43.763	2285040	1	3	6110.	B
49.116	2210220	9	3*	2450.	C
49.222	2361010	3	5	8900.	C
52.296	2241590	3	1	760.	C
303.30	329690	1	3	64.2	B
358.29	608790	3	1	103.	C
358.63	451000	3	5	13.8	C
361.41	446510	1	3	18.0	C
364.50	446510	3	3	13.2	C
365.42	451000	5	5	39.0	C
368.28	443690	3	1	51.	C
371.48	446510	5	3	20.7	C
604.14	495210	3	5	11.2	C
2300.8	2285040	1	3	.434	C
	Si XII				
40.924	2443500	2	6*	4420.	B
44.118	2464130	6	10*	1.4 (+4)	B
499.43	200290	2	4	9.56	B
520.72	191900	2	2	8.47	B
1862.	2444300	2	4	1.15	B
1949.	2441900	2	2	1.0	B
4620.	2463540	2	4	.046	C
4942.	2464530	4	6	.045	C
	Silver				
	Ag I				
2061.2	48501	2	4	.031	D
2069.9	48297	2	2	.015	D
3280.7	30473	2	4	1.4	B
3382.9	29552	2	2	1.3	B
5209.1	48744	2	4	.75	D
5465.5	48764	4	6	.86	D
5471.6	48744	4	4	.14	D

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Sodium				
	Na I				
3302.4	30273	2	4	.0281	C
3303.0	30267	2	2	.0281	C
4390.0	39729	2	4	.0077	D
4393.3	39729	4	4	.0016	D
4393.3	39729	4	6	.0092	D
4494.2	39201	2	4	.012	C
4497.7	39201	4	6	.014	C
4497.7	39201	4	4	.0024	D
4664.8	38387	2	4	.0233	C
4668.6	38387	4	4	.0041	D
4668.6	38387	4	6	.025	C
4747.9	38012	2	2	.0063	D
4751.8	38012	4	2	.0127	C
4978.5	37037	2	4	.041	C
4982.8	37037	4	4	.0082	D
4982.8	37037	4	6	.0489	C
5148.8	36373	2	2	.0117	C
5153.4	36373	4	2	.0233	C
5682.6	34549	2	4	.103	C
5688.2	34549	4	6	.12	C
5688.2	34549	4	4	.021	D
5890.0	16973	2	4	.622	A
5895.9	16956	2	2	.618	A
6154.2	33201	2	2	.026	C
6160.8	33201	4	2	.052	C
8183.3	29173	2	4	.453	C
8194.8	29173	4	6	.54	C
8194.8	29173	4	4	.090	D
11381.	25740	2	2	.089	C
11404.	25740	4	2	.176	C
	Na II				
300.15	333163	1	3	30.	D
301.44	331745	1	3	49.	D
372.08	268763	1	3	34.	D
	Na III				
378.14	264455	4	2	77.	C
380.10	264455	2	2	37.	C
1991.0	465399	4	6	8.3	D
2004.2	466788	2	4	4.6	D
2011.9	463971	6	8	8.4	D
2151.5	465018	2	4	4.4	D
2174.5	464390	4	6	5.3	D
2230.3	410977	6	8	3.7	D
2232.2	418418	4	4	3.3	D
2246.7	411536	4	6	2.4	D
2459.3	414282	4	6	3.0	D
2468.9	415172	2	4	2.4	D
2497.0	406190	6	6	1.7	D
	Na V				
307.89	372400	10	6*	200.	C
333.46	372400	6	6*	56.	C
369.01	568100	10	6*	120.	D
400.72	297100	10	10*	50.	C
445.14	297100	6	10*	7.1	C
459.90	217440	4	2	23.	D
461.05	216896	4	4	23.	D
463.26	215860	4	6	22.	D
510.10	569200	2	2	56.	D
511.19	567600	4	4	68.	D

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Na VI				
313.75	320589	5	3	130.	C
361.25	312175	5	5	77.	C
416.53	241341	9	9*	37.	C
492.80	204187	9	15*	13.	C
1550.6	873287	5	5	4.35	C
1567.8	872577	5	3	2.68	C
1608.5	934745	3	1	2.6	C
1649.4	933915	5	5	2.05	C
1741.5	929999	3	5	2.59	C
1747.5	930510	5	7	3.1	C
	Na VII				
94.409	1060651	6	10*	2700.	C
105.27	951347	6	2*	450.	C
353.29	285189	4	4	100.	C
381.30	264400	4	2	40.	C
397.49	367500	4	4	35.	C
399.18	367500	6	4	52.	C
483.28	412345	10	10*	29.	C
486.74	205448	2	4	11.	C
491.95	205412	4	6	13.	C
555.80	465111	4	4	23.	D
777.83	412311	4	6	6.8	D
	Na VIII				
83.34	1327500	9	15*	3940.	C
89.88	1240300	9	3*	809.	C
90.536	1347756	3	5	2860.	C
411.15	243223	1	3	44.2	C
1239.4	1432991	3	3	3.02	C
1802.7	1481521	3	1	2.70	C
1867.7	1347756	3	5	2.01	C
2059.1	1474598	3	5	1.80	C
2558.2	1513677	5	3	.0226	C
2772.0	1469055	3	5	.419	C
3021.0	1507690	5	7	.490	C
3108.9	1513677	1	3	.258	C
3182.3	1294214	1	3	.292	C
	Na IX				
70.615	1416130	2	4	1350.	B
70.653	1415368	2	2	1350.	B
77.764	1429980	2	4	3600.	B
77.911	1430204	4	6	4300.	B
681.72	146688	2	4	6.63	B
694.17	144038	2	2	6.30	B
2487.7	1416130	2	4	.832	B
2535.8	1415368	2	2	.789	B
6841.8	1429980	2	4	.0259	C
7103.4	1430204	4	6	.0278	C
	Strontium				
	Sr I				
2206.2	45312	1	3	.0066	C
2211.3	45208	1	3	.0085	C
2217.8	45075	1	3	.012	C
2226.3	44904	1	3	.016	C
2237.7	44676	1	3	.023	C
2253.3	44366	1	3	.037	C
2275.3	43937	1	3	.067	C
2307.3	43328	1	3	.12	C
2354.3	42462	1	3	.18	C
2428.1	41172	1	3	.17	C
2569.5	38907	1	3	.053	C
2931.8	34098	1	3	.019	C
4607.3	21698	1	3	2.01	B
	Sr II				
2018.7	73237	2	2	.12	D
2051.9	73237	4	2	.24	D
2282.0	67523	2	4	.83	D
2322.4	67563	4	6	.91	D
2324.5	67523	4	4	.15	D
2423.5	64964	2	2	.24	D
2471.6	64964	4	2	.48	D
3464.5	53373	4	6	3.1	D
3474.9	53286	4	4	.51	D
4077.7	24517	2	4	1.42	C
4161.8	47737	2	2	.65	D
4215.5	23715	2	2	1.27	C
4305.5	47737	4	2	1.4	D
4414.8	78702	4	6	.11	D
4417.5	78689	4	4	.018	D
4585.9	77858	4	2	.070	D
5303.1	74621	2	4	.19	D
5379.1	74643	4	6	.22	D
5385.5	74621	4	4	.037	D
5723.7	73237	2	2	.071	D
5819.0	73237	4	2	.14	D
8688.9	67563	4	6	.55	D
8719.6	67523	4	4	.097	D
	Sulfur				
	S I				
1295.7	77181	5	5	4.9	D
1296.2	77150	5	3	2.7	D
1302.3	77181	3	5	1.8	D
1302.9	77150	3	3	1.6	D
1303.1	77136	3	1	6.6	D
1303.4	76721	5	3	1.9	D
1305.9	77150	1	3	2.4	D
1401.5	71351	5	3	.91	D
1409.3	71351	3	3	.50	D
1412.9	71351	1	3	.16	D
1425.0	70174	5	7	4.5	D
1425.2	70166	5	5	1.2	D
1433.3	70166	3	5	3.3	D
1433.3	70165	3	3	1.9	D
1437.0	70165	1	3	2.4	D
1448.2	78288	5	3	7.3	D
1473.0	67890	5	7	.42	D
1474.0	67843	5	7	1.6	D
1474.4	67825	5	5	.50	D
1474.6	67816	5	3	.062	D
1481.7	67888	3	5	.17	D
1483.0	67825	3	5	1.2	D
1483.2	67816	3	3	.75	D
1487.2	67816	1	3	.87	D
1666.7	69238	5	5	6.3	C
1687.5	81438	1	3	.94	D
1782.3	78288	1	3	1.9	D
1807.3	55331	5	3	3.8	C
1820.3	55331	3	3	2.2	C
1826.2	55331	1	3	.72	C

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	S I				
4694.1	73921	5	7	.0067	D
4695.4	73915	5	5	.0067	D
4696.2	73911	5	3	.0065	D
6403.6	79058	3	5	.0057	D
6408.1	79058	5	5	.0095	D
6415.5	79058	7	5	.013	D
6751.2	78271	15	25*	.079	D
7679.6	76464	3	5	.012	D
7686.1	76464	5	5	.020	D
7696.7	76464	7	5	.028	D
	S II				
1124.4	113461	2	4	1.0	D
1125.0	113461	4	4	4.6	D
1131.0	112937	2	2	3.5	D
1131.6	112937	4	2	1.4	D
1250.5	79968	4	2	.46	C
1253.8	79758	4	4	.42	C
1259.5	79395	4	6	.34	C
4463.6	150996	8	6	.53	D
4483.4	150531	6	4	.31	D
4486.7	150258	4	2	.66	D
4524.7	143623	4	4	.093	D
4525.0	143623	6	4	1.2	D
4552.4	143489	4	2	1.2	D
4656.7	131029	2	4	.09	D
4716.2	131029	4	4	.29	D
4815.5	131029	6	4	.88	D
4885.6	133400	2	4	.17	D
4917.2	133269	2	2	.66	D
4924.1	130134	4	6	.22	D
4925.3	129858	2	4	.24	D
4942.5	129788	2	2	.15	D
4991.9	129858	4	4	.15	D
5009.5	129788	4	2	.70	D
5014.0	133400	4	4	.84	D
5027.2	125485	4	2	.26	D
5032.4	130134	6	6	.81	D
5047.3	133269	4	2	.36	D
5103.3	129858	6	4	.50	D
5142.3	125485	2	2	.19	D
5201.0	140750	4	4	.75	D
5201.3	140750	6	4	.065	D
5212.6	140709	4	6	.098	D
5212.6	140709	6	6	.85	D
5320.7	140319	6	8	.92	D
5345.7	140230	4	6	.88	D
5345.7	140230	6	6	.11	D
5428.6	127976	2	4	.42	D
5432.8	128233	4	6	.68	D
5453.8	128599	6	8	.85	D
5473.6	127825	2	2	.73	D
5509.7	127976	4	4	.40	D
5526.2	128599	8	8	.081	D
5536.8	128233	4	6	.066	D
5556.0	127825	4	2	.11	D
5564.9	128233	6	6	.17	D
5578.8	128233	6	6	.11	D
5606.1	128599	10	8	.54	D
5616.6	127976	4	4	.12	D
5640.0	131187	4	6	.66	D
5645.6	127976	6	4	.018	D
5647.0	130641	2	4	.57	D
5659.9	127976	6	4	.46	D
5664.7	127825	4	2	.58	D
5819.2	130641	4	4	.085	D
6305.5	130134	8	6	.18	D
6312.7	130641	6	4	.30	D
	S III				
2496.2	210698	7	5	2.5	D
2508.2	209926	5	3	2.3	D
2636.9	210698	3	5	.45	D
2665.4	210698	5	5	1.4	D
2680.5	209926	1	3	.62	D
2691.8	209926	3	3	.46	D
2702.8	209773	3	1	1.9	D
2718.9	206539	3	3	1.2	D
2721.4	209926	5	3	.77	D
2726.8	210698	3	5	.60	D
2731.1	206672	5	5	1.1	D
2756.9	206911	7	7	1.4	D
2785.5	209926	3	3	.61	D
2856.0	205071	5	7	5.1	D
2863.5	205561	7	9	5.7	D
2872.0	204579	3	5	4.7	D
2950.2	206672	3	5	3.0	D
2964.8	206911	5	7	4.0	D
3662.0	174036	3	3	.64	D
3717.8	174036	5	3	1.0	D
3778.9	173192	3	5	.44	D
3831.8	172786	1	3	.56	D
3837.8	172786	3	3	.42	D
3838.3	173192	5	5	1.3	D
3860.6	172631	3	1	1.6	D
3899.1	172786	5	3	.67	D
4253.6	170649	5	7	1.2	D
4285.0	170067	3	5	.90	D
	S IV				
551.17	181432	2	2	20.6	C
554.07	181432	4	2	40.8	C
3097.5	213717	2	4	2.6	D
3117.7	213507	2	2	2.5	D
	S V				
437.37	311700	1	3	11.2	C
438.19	311700	3	3	33.3	C
439.65	311700	5	3	55.	C
661.52	235000	9	15*	64.4	B
679.01	348100	9	15*	86.	D
690.75	345600	9	9*	50.	D
786.48	127149	1	3	52.5	B
854.85	200800	9	9*	41.8	C
	S VI				
248.99	401621	2	4	31.	C
249.27	401164	2	2	31.	C
388.94	362983	2	2	45.	C
390.86	362983	4	2	88.	C
706.48	247420	2	4	41.7	C
712.68	247452	4	6	48.5	C
712.84	247420	4	4	8.1	D
933.38	107137	2	4	17.	C
944.52	105874	2	2	16.	C

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	S VII				
60.161	1662210	1	3	9460.	B
60.804	1644630	1	3	510.	B
72.029	1388330	1	3	861.	B
	S VIII				
198.55	503590	4	2	250.	C
202.61	503590	2	2	120.	C
	S XI				
189.90	535250	9	3*	430.	C
190.37	592500	5	3	280.	C
215.95	530180	5	5	140.	C
217.63	592500	1	3	72.	C
239.81	417040	1	3	26.	D
242.57	417420	3	5	19.	D
242.82	417040	3	3	19.	D
246.90	417420	5	5	54.	D
247.12	417040	5	3	30.	D
288.49	355260	9	15*	29.	C
	S XII				
212.14	471480	2	4	37.	C
215.18	464750	2	2	140.	C
218.20	471480	4	4	170.	C
221.44	464750	4	2	64.	C
227.50	439540	2	2	37.	C
234.48	439540	4	2	68.	C
	S XIII				
32.236	3102150	1	3	1.09(+4)	B
37.600	3049260	3	1	1300.	C
256.66	389660	1	3	87.	C
299.89	537520	3	5	17.8	C
303.37	529420	1	3	22.8	C
307.36	529420	3	3	16.4	C
308.91	537520	5	5	48.2	C
312.68	523880	3	1	63.	C
316.84	529420	5	3	25.0	C
500.42	3012200	3	5	14.3	C
	S XIV				
30.434	3285500	2	6*	8280.	B
32.517	3309780	6	10*	2.6 (+4)	B
417.67	239460	2	4	12.	B
445.71	224330	2	2	10.	B
1550.	3287000	2	4	1.4	B
1663.	3282640	2	2	1.2	B
3967.	3307840	2	4	.054	C
4153.	3311070	4	6	.057	C
	Thallium				
	Tl I				
2104.6	47500	2	4	.040	D
2118.9	47179	2	2	.020	D
2129.3	46950	2	4	.058	D
2151.9	46457	2	2	.031	D
2168.6	46099	2	4	.098	D
2237.8	44673	2	4	.19	D
2316.0	43166	2	2	.078	D
2379.7	42011	2	4	.44	C
2507.9	47655	4	2	.011	C
2538.2	47179	4	2	.016	C
2580.1	38746	2	2	.18	D
2609.0	46110	4	6	.10	C
2609.8	46099	4	4	.019	C
2665.6	45297	4	2	.057	C
2709.2	44693	4	6	.17	C
2710.7	44673	4	4	.037	C
2767.9	36118	2	4	1.26	C
2826.2	43166	4	2	.080	C
2918.3	42049	4	6	.42	C
2921.5	42011	4	4	.076	C
3229.8	38746	4	2	.173	C
3519.2	36200	4	6	1.24	C
3529.4	36118	4	4	.220	C
3775.7	26478	2	2	.625	B
5350.5	26478	4	2	.705	B
	Thulium				
	Tm I				
2513.8	39769	8	10	.069	D
2527.0	39560	8	8	.17	D
2596.5	38502	8	10	.16	D
2601.1	38434	8	6	.17	D
2622.5	38121	8	10	.061	D
2841.1	43958	6	6	.20	D
2854.2	35026	8	6	.27	D
2914.8	34297	8	8	.077	D
2933.0	34085	8	6	.10	D
2973.2	33624	8	8	.23	D
3046.9	32811	8	8	.18	D
3081.1	32446	8	8	.19	D
3122.5	40787	6	6	.52	D
3142.4	40585	6	6	.088	D
3172.7	31510	8	8	.18	D
3233.7	30915	8	10	.051	D
3247.0	39560	6	8	.30	D
3251.8	39515	6	4	.52	D
3380.7	38343	6	8	.20	D
3406.0	38123	6	8	.15	D
3410.1	29317	8	10	.10	D
3416.6	29261	8	8	.057	D
3418.6	38014	6	6	.11	D
3563.9	28051	8	6	.098	D
3567.4	28024	8	10	.042	D
3744.1	26701	8	8	.95	D
3751.8	26646	8	10	.19	D
3798.5	35090	6	4	1.2	D
3807.7	35026	6	6	.39	D
3883.1	25745	8	6	1.0	D
3887.4	25717	8	8	.38	D
3916.5	34297	6	8	1.5	D
3949.3	34085	6	6	1.0	D
4022.6	33624	6	8	.040	D
4044.5	33489	6	4	.29	D
4094.2	24418	8	6	.90	C
4105.8	24349	8	10	.60	C
4138.3	32929	6	4	.70	D
4158.6	32811	6	8	.055	D
4187.6	23873	8	8	.61	C
4203.7	23782	8	10	.25	C
4222.7	32446	6	8	.15	D
4271.7	32174	6	6	.11	D
4359.9	22930	8	6	.13	D
4386.4	22791	8	8	.042	D
4394.4	31521	6	4	.11	D

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Tm I				
4643.1	30302	6	6	.034	D
4681.9	30124	6	8	.039	D
4691.1	30082	6	6	.039	D
5307.1	18837	8	10	.023	D
5658.3	26439	6	8	.010	D
5675.8	17614	8	10	.013	D
5760.2	26127	6	6	.013	D
	Tin				
	Sn I				
2073.1	48222	1	3	.036	D
2199.3	47146	3	5	.29	D
2209.7	48670	5	5	.56	D
2246.1	44509	1	3	1.6	D
2268.9	47488	5	7	1.2	D
2286.7	47146	5	5	.31	D
2317.2	51755	5	7	2.0	D
2334.8	44509	3	3	.66	D
2354.8	44145	3	5	1.7	D
2380.7	43683	3	5	.031	D
2408.2	50126	5	3	.18	D
2421.7	49894	5	7	2.5	D
2429.5	44576	5	7	1.5	C
2433.5	44509	5	3	.0080	D
2455.2	44145	5	5	.011	D
2476.4	48982	5	3	.011	D
2483.4	43683	5	5	.21	D
2491.8	57282	1	3	.17	D
2495.7	48670	5	5	.62	D
2523.9	48222	5	3	.074	D
2546.6	39257	1	3	.21	D
2558.0	56244	1	3	.34	D
2571.6	47488	5	7	.45	D
2594.4	47146	5	5	.30	D
2636.9	55074	1	3	.11	D
2661.2	39257	3	3	.11	D
2706.5	38629	3	5	.66	D
2761.8	39626	5	5	.0037	D
2779.8	44576	5	7	.18	D
2785.0	44509	5	3	.14	D
2788.0	53021	1	3	.14	D
2812.6	52707	1	3	.23	D
2813.6	44145	5	5	.12	D
2840.0	38629	5	5	1.7	D
2850.6	43683	5	5	.33	D
2863.3	34914	1	3	.54	D
2913.5	51475	1	3	.83	D
3009.1	34914	3	3	.38	D
3032.8	50126	1	3	.62	D
3034.1	34641	3	1	2.0	D
3141.8	48982	1	3	.19	D
3175.1	34914	5	3	1.0	D
3218.7	48222	1	3	.047	D
3223.6	39626	5	5	.0012	D
3262.3	39257	5	3	2.7	D
3330.6	38629	5	5	.20	D
3655.8	44509	1	3	.041	D
3801.0	34914	5	3	.28	D
4524.7	39257	1	3	.26	D
5631.7	34914	1	3	.024	D
5970.3	55374	5	3	.096	D
6037.7	55187	5	5	.050	D
6069.0	51113	1	3	.046	D
6073.5	51375	3	1	.063	D
6171.5	51113	3	3	.049	D
	Sn II				
2368.3	46464	4	2	.0044	D
2449.0	99663	4	6	.37	D
2487.0	99659	6	8	.55	D
3283.2	89292	4	6	1.0	D
3352.0	89286	6	8	1.0	D
3472.5	100285	2	4	.16	D
3575.5	100339	4	6	.13	D
5332.4	90242	2	4	.86	D
5562.0	90354	4	6	1.2	D
5588.9	89292	4	6	.85	D
5596.2	90242	4	4	.15	D
5797.2	89292	6	6	.28	D
5799.2	89286	6	8	.81	D
6453.5	72377	2	4	1.2	D
6761.5	86280	2	2	.32	D
6844.1	71494	2	2	.66	D
	Titanium				
	Ti I				
2276.7	44080	7	5	1.3	C
2299.9	43468	5	5	.69	C
2384.5	42311	9	7	.090	C
2424.2	41624	9	9	.17	C
2441.0	41342	9	11	.072	C
2520.5	39662	5	3	.38	C
2529.9	39686	7	5	.38	C
2541.9	39715	9	7	.43	C
2599.9	38451	5	5	.67	C
2605.2	38544	7	7	.64	C
2611.3	38671	9	9	.64	C
2611.5	38451	7	5	.33	C
2632.4	37977	5	5	.27	C
2641.1	37852	5	3	1.8	C
2644.3	37977	7	5	1.4	C
2646.6	38160	9	7	1.5	C
2662.0	37555	5	7	.089	C
2669.6	37618	7	9	.10	C
2679.9	37690	9	11	.13	C
2735.3	45041	3	1	4.1	D
2912.1	41585	5	7	1.3	D
2933.6	34079	5	7	.096	C
2942.0	33981	5	5	1.0	C
2948.3	34079	7	7	.93	C
2956.1	34205	9	9	.97	C
2967.2	34079	9	7	.11	C
2983.3	33680	7	7	.11	C
3000.9	33701	9	9	.12	C
3186.5	31374	5	7	.80	C
3192.0	31489	7	9	.85	C
3199.9	31629	9	11	.94	C
3203.8	31374	7	7	.072	C
3214.2	31489	9	9	.065	C
3341.9	29915	5	7	.65	C
3354.6	29971	7	9	.64	C
3370.4	29661	5	3	.76	C
3371.5	30039	9	11	.67	C
3377.6	29769	7	5	.69	C

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Ti I				
3385.7	29915	9	7	.052	C
3635.5	27499	5	7	.72	C
3642.7	27615	7	9	.67	C
3653.5	27750	9	11	.66	C
3654.6	27355	5	3	.087	C
3671.7	27615	9	9	.048	C
3689.9	27480	9	7	.045	C
3717.4	26893	5	7	.043	C
3724.6	38959	9	9	.91	D
3729.8	26803	5	5	.40	C
3741.1	26893	7	7	.38	C
3752.9	27026	9	9	.47	C
3771.7	26893	9	7	.066	C
3786.0	33661	5	3	1.4	D
3924.5	25644	7	7	.073	C
3929.9	25439	5	5	.075	C
3948.7	25318	5	3	.53	C
3958.2	25644	9	7	.43	C
3981.8	25107	5	5	.38	C
3989.8	25227	7	7	.36	C
3998.6	25388	9	9	.39	C
4008.9	25107	7	5	.071	C
4024.6	25227	9	7	.063	C
4065.1	33085	3	1	.70	D
4186.1	36000	9	9	.28	D
4285.0	37359	5	5	.32	D
4295.8	29829	3	1	1.3	D
4393.9	41040	9	11	.33	D
4417.3	37852	11	9	.36	D
4449.2	37690	11	11	.97	D
4455.3	34079	7	7	.48	D
4457.4	34205	9	9	.56	D
4481.3	36415	7	7	.57	D
4527.3	28639	3	5	.22	D
4544.7	28596	5	3	.33	D
4656.5	21469	5	7	.022	C
4667.6	21588	7	9	.023	C
4681.9	21740	9	11	.025	C
4981.7	26911	11	13	.59	C
4991.1	26773	9	11	.50	C
4999.5	26657	7	9	.50	C
5007.2	26564	5	7	.48	C
5014.2	26494	3	5	.68	C
5022.9	26564	7	7	.15	C
5024.8	26494	5	5	.15	C
5040.0	20006	7	5	.036	C
5064.7	20126	9	7	.043	C
5173.8	19323	5	5	.037	C
5193.0	19422	7	7	.032	C
5210.4	19574	9	9	.034	C
5866.5	25644	5	7	.046	C
5899.3	25439	3	5	.031	C
6258.1	27615	7	9	.091	C
7251.7	25318	5	3	.072	C
8024.8	27615	9	9	.0083	C
8068.2	27499	7	7	.0077	C
	Ti II				
2635.6	68768	4	4	1.9	D
2638.7	68845	6	6	1.7	D
2642.2	68950	8	8	1.8	D
2646.1	69081	10	10	2.7	D
2752.8	69081	8	10	1.1	D
2800.6	66997	10	8	1.8	D
2805.0	65185	6	8	4.6	D
2810.3	65307	8	10	5.1	D
2817.9	65446	10	12	3.8	D
2827.2	65094	8	10	1.0	D
2828.2	65589	12	14	4.4	D
2828.9	65307	10	10	.92	D
2834.1	65242	10	12	.79	D
2836.6	64978	8	8	1.2	D
2839.7	65446	12	12	.83	D
2846.1	65094	10	10	1.2	D
2856.2	65242	12	12	1.5	D
2931.3	65313	6	6	3.2	D
2936.2	64885	4	6	2.7	D
2938.7	64978	6	8	2.4	D
2942.0	65094	8	10	1.8	D
2943.1	65459	8	8	1.1	D
2945.5	65242	10	12	2.7	D
2954.8	68582	10	12	4.0	D
2959.0	68329	10	10	4.0	D
3081.6	62410	10	8	1.1	D
3088.0	32767	10	8	1.3	C
3089.4	47625	8	6	1.3	C
3103.8	47467	10	8	1.1	C
3127.9	63168	6	6	1.6	D
3128.6	63445	8	8	1.2	D
3190.9	40075	6	8	1.3	C
3202.5	39927	4	6	1.1	C
3224.2	43781	12	10	.70	C
3234.5	31301	10	10	1.3	C
3236.6	31114	8	8	1.1	D
3287.7	45674	8	10	1.4	C
3341.9	34543	6	8	.96	D
3349.0	34749	8	10	1.0	D
3349.4	30241	10	12	1.3	D
3361.2	29968	8	10	1.2	D
3372.8	29734	6	8	1.1	C
3383.8	29544	4	6	1.1	C
3483.8	63445	10	8	.97	D
3492.4	63168	8	6	.98	D
3504.9	43781	10	10	.82	D
3510.8	43741	8	8	.93	D
3759.3	31491	8	8	.96	D
3761.3	31207	6	6	1.0	D
	Ti III				
2375.0	83797	5	3	4.0	D
2414.0	83117	5	7	3.8	D
2516.1	78159	7	9	3.4	D
2527.8	77746	5	7	2.2	D
2540.1	77422	3	5	2.0	D
2563.4	77424	7	7	2.1	D
2565.4	77167	5	5	1.6	D
2567.6	77000	3	3	2.3	D
2576.5	77000	5	3	.92	D
2984.8	75198	5	5	1.9	D
	Ti XIX				
169.33	590580	1	3	129.	C
	Ti XX				
11.452	8732000	2	6*	1.7 (+4)	C

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Ti XX				
11.872	8749000	2	4	2.8 (+4)	C
11.958	8751000	4	6	3.4 (+4)	C
15.211	6574000	2	4	3.50(+4)	B
15.253	6556000	2	2	3.58(+4)	B
15.907	6612000	2	4	8.8 (+4)	C
16.049	6619000	4	6	1.1 (+5)	C
16.067	6612000	4	4	1.7 (+4)	C
	Uranium				
	U I				
3553.0	32413	13	13	.020	C
3553.0	32591	9	7	.014	C
3553.4	31935	15	13	.022	C
3554.5	28746	11	9	.0084	C
3554.9	31923	15	17	.0079	C
3555.3	28119	13	15	.027	C
3555.8	28115	13	11	.0041	C
3556.9	32382	13	11	.0075	C
3557.8	28099	13	13	.029	C
3558.0	33860	11	13	.016	C
3558.6	32546	9	7	.039	C
3559.4	31955	7	9	.015	C
3560.3	34071	9	7	.064	C
3561.4	31872	15	13	.055	C
3561.5	34062	9	9	.025	C
3561.8	28068	13	11	.057	C
3563.7	28053	13	13	.029	C
3563.8	31920	7	7	.011	C
3565.0	32318	13	11	.029	C
3566.0	32310	13	15	.017	C
3566.6	28650	11	11	.24	B
3568.8	32289	13	13	.038	C
3569.1	35656	17	15	.11	C
3569.4	32462	9	9	.015	C
3570.1	32278	13	11	.013	C
3570.2	28622	11	9	.0053	C
3570.6	35004	13	15	.027	C
3570.7	31798	15	15	.012	C
3571.2	28614	11	11	.0063	C
3571.6	38338	17	15	.13	C
3572.9	32256	13	15	.015	C
3573.9	27973	13	11	.040	C
3574.1	34977	13	15	.035	C
3574.8	27966	13	15	.019	C
3577.1	35594	17	15	.043	C
3577.5	31745	15	13	.0078	C
3577.8	28563	11	11	.0083	C
3577.9	27941	13	13	.023	C
3578.3	27938	13	11	.020	C
3580.0	32379	9	9	.012	C
3580.2	28543	11	9	.029	C
3580.4	28542	11	13	.0075	C
3580.9	32194	13	13	.021	C
3582.6	32180	13	13	.029	C
3584.6	31757	7	5	.024	C
3584.9	27887	13	15	.18	B
3585.4	28503	11	11	.019	C
3585.8	28500	11	9	.028	C
3587.8	32318	9	11	.013	C
3588.3	31729	7	9	.018	C
3589.7	28470	11	13	.021	C
3589.8	31650	15	13	.059	C
3590.7	32295	9	7	.022	C
3591.7	28454	11	9	.053	C
3593.0	28445	11	11	.014	C
3593.2	32098	13	15	.042	C
3593.7	33581	11	11	.072	C
	Vanadium				
	V I				
3050.4	43874	10	8	.47	D
3053.7	32738	4	4	1.1	D
3056.3	32847	6	6	1.0	D
3060.5	32989	8	8	1.1	D
3066.4	33155	10	10	1.6	D
3088.1	42010	4	6	.43	D
3089.1	41999	4	4	.45	D
3093.8	42138	6	6	.36	D
3112.9	41752	4	2	.43	D
3183.4	31541	6	8	1.3	D
3185.4	31937	10	12	1.4	D
3198.0	31398	6	6	.31	D
3202.4	31541	8	8	.29	D
3205.6	42079	8	10	1.1	D
3212.4	42221	10	12	1.2	D
3218.9	41950	8	6	.31	D
3233.2	42021	10	8	.28	D
3273.0	41437	8	8	.24	D
3284.4	41539	10	10	.24	D
3309.2	39847	4	4	.28	D
3329.9	39847	6	4	.69	D
3356.4	39423	4	6	.27	D
3365.6	39249	2	4	.41	D
3376.1	39249	4	4	.28	D
3377.4	39237	4	2	.80	D
3377.6	39423	6	6	.53	D
3400.4	38116	8	8	.22	D
3529.7	37960	4	6	.36	D
3533.7	38116	6	8	.44	D
3533.8	37835	2	4	.32	D
3543.5	37757	2	2	.58	D
3545.3	37835	4	4	.32	D
3663.6	43649	4	6	2.7	D
3667.7	43707	6	8	2.4	D
3671.2	38124	8	10	.18	D
3672.4	44140	12	12	.79	D
3673.4	43788	8	10	2.4	D
3676.7	44327	14	14	1.1	D
3680.1	43894	10	12	1.9	D
3686.3	38221	10	12	.20	D
3687.5	44028	12	14	2.6	D
3688.1	29418	8	8	.28	D
3690.3	29203	2	4	.37	D
3692.2	29296	6	6	.46	D
3695.3	44190	14	16	2.5	D
3695.9	29203	4	4	.54	D
3703.6	29418	10	8	.79	D
3704.7	29296	8	6	.58	D
3705.0	29203	6	4	.31	D
3706.0	42079	10	10	.46	D
3708.7	42221	12	12	.39	D
3790.5	37475	10	8	.20	D
3795.0	28768	10	10	.21	D
3806.8	37362	10	10	.22	D

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	V I				
3818.2	26183	4	2	.56	C
3828.6	26249	6	4	.431	C
3840.1	36926	8	8	.18	D
3840.8	26353	8	6	.46	D
3855.4	25931	4	4	.28	D
3855.8	26480	10	8	.451	C
3863.9	36766	8	6	.27	D
3864.3	36763	8	6	.17	D
3864.9	26004	6	6	.208	C
3871.1	36926	10	8	.24	D
3875.1	26122	8	8	.17	D
3886.6	36823	10	8	.14	D
3902.3	26172	10	10	.217	C
3921.9	33967	4	2	.23	D
3922.4	34066	6	6	.23	D
3930.0	36539	10	10	.29	D
3934.0	34128	8	8	.56	D
3992.8	40039	12	10	1.1	D
3998.7	40064	14	12	.92	D
4051.0	41861	10	10	1.2	D
4051.4	41918	12	12	1.2	D
4090.6	33155	8	10	.77	D
4092.7	26738	8	10	.21	D
4095.5	32989	6	8	.54	D
4099.8	26605	6	8	.39	D
4102.2	32847	4	6	.50	D
4104.8	40126	10	8	1.9	D
4105.2	26506	4	6	.42	D
4109.8	26438	2	4	.47	D
4111.8	26738	10	10	.91	D
4113.5	34128	6	8	.15	D
4115.2	26605	8	8	.59	D
4116.5	26506	6	6	.24	D
4123.6	26397	4	2	.94	D
4128.1	26438	6	4	.70	D
4132.0	26506	8	6	.52	D
4134.5	26605	10	8	.27	D
4232.5	39391	10	10	.86	D
4233.0	39342	8	8	.67	D
4268.6	38483	14	14	1.0	D
4271.6	38405	12	12	.84	D
4277.0	38324	10	10	.84	D
4284.1	38246	8	8	1.0	D
4291.8	40536	12	14	.78	D
4296.1	40452	10	12	.69	D
4297.7	40379	8	10	.61	D
4298.0	40315	6	8	.70	D
4342.8	38124	10	10	.13	D
4355.0	38221	12	12	.11	D
4379.2	25254	10	12	1.2	D
4384.7	25112	8	10	.97	D
4390.0	24993	6	8	.70	D
4395.2	24899	4	6	.48	D
4400.6	24830	2	4	.33	D
4406.6	25112	10	10	.19	D
4407.6	24993	8	8	.38	D
4408.2	24899	6	6	.51	D
4416.5	24789	4	2	.21	D
4452.0	37518	14	16	.80	D
4457.8	37530	10	12	.24	D
4460.3	24839	10	8	.26	D
4462.4	37404	12	14	.66	D
4468.0	37285	8	10	.20	D
4469.7	37316	10	12	.53	D
4474.0	38116	10	8	.41	D
4490.8	37211	10	12	.10	D
4496.1	37960	8	6	.35	D
4514.2	37835	6	4	.29	D
4524.2	37362	12	10	.26	D
4525.2	37757	4	2	.36	D
4529.6	37175	10	8	.21	D
4545.4	37765	10	12	.67	D
4560.7	37644	8	10	.62	D
4571.8	37556	6	8	.53	D
4578.7	37499	4	6	.59	D
4579.2	37556	8	8	.13	D
4706.2	36815	6	4	.21	D
4706.6	38483	12	14	.15	D
4710.6	38405	10	12	.17	D
4746.6	37423	4	4	.17	D
4751.0	37615	8	8	.15	D
4754.0	37758	10	10	.13	D
4757.5	37375	4	2	.65	D
4766.6	37423	6	4	.48	D
4776.4	37503	8	6	.43	D
4786.5	37615	10	8	.40	D
4796.9	37758	12	10	.42	D
4807.5	37931	14	12	.51	D
5193.0	37931	12	12	.35	D
5195.4	37615	8	8	.21	D
5234.1	38124	10	10	.41	D
5240.9	38221	12	12	.39	D
5415.3	37606	12	14	.27	D
5487.9	37362	12	10	.25	D
5507.8	37175	10	8	.30	D
5559.9	31786	6	2*	.14	D
5698.5	26122	6	8	.28	D
5703.6	26004	4	6	.19	D
5707.0	25931	2	4	.19	D
5725.6	36539	8	10	.18	D
5727.0	26172	8	10	.18	D
6090.2	25131	8	6	.13	D
	V II				
2503.0	48580	5	7	.23	C
2506.2	48731	7	9	.23	C
2514.6	48853	9	11	.24	C
2672.0	37521	5	7	.18	D
2677.8	37369	3	5	.29	D
2679.3	37521	7	7	.26	D
2688.0	37531	9	9	.60	D
2690.8	37259	5	3	.43	D
2700.9	37352	9	11	.29	C
2702.2	37205	7	7	.20	D
2706.2	37151	7	9	.29	C
2728.6	36673	3	5	.20	C
2768.6	48731	11	9	.82	C
2774.3	48580	9	7	.88	C
2799.5	49202	5	5	.60	C
2802.8	49211	7	7	.46	C
2803.5	49269	9	9	.58	C
2836.5	48853	9	11	.25	C
2841.0	48731	7	9	.27	C
2877.7	49202	7	5	.67	C

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	V II				
2880.0	37521	7	7	.15	D
2882.5	37369	5	5	.27	D
2888.3	49269	11	9	.54	C
2889.6	37201	3	1	1.4	D
2891.6	37259	5	3	.92	D
2893.3	37521	9	7	.70	D
2903.1	37041	3	5	.21	D
2906.5	37205	7	7	.53	D
2907.5	37352	9	11	.19	C
2908.8	37531	11	9	1.1	D
2910.0	37041	5	5	.72	D
2910.4	36955	3	3	.87	D
2911.1	37151	7	9	.30	C
2924.6	37151	9	9	.91	C
2930.1	48580	7	7	.27	C
2944.6	36919	9	7	.65	C
2950.4	36489	3	3	.34	C
2952.1	36673	7	5	.58	C
2957.5	36489	5	3	.44	C
3048.9	49211	9	7	.54	C
3093.1	35483	11	13	1.8	D
3100.9	48580	7	7	1.0	C
3102.3	35193	9	11	1.6	D
3110.7	34947	7	9	1.5	D
3118.4	34746	5	7	1.5	D
3121.1	35193	11	11	.22	D
3125.3	34593	3	5	1.6	D
3126.2	34947	9	9	.41	D
3130.3	34746	7	7	.50	D
3133.3	34593	5	5	.48	D
3187.7	40002	5	5	.85	D
3188.5	40196	7	7	.80	D
3190.7	40430	9	9	.88	D
3208.4	40002	7	5	.17	D
3232.0	49202	3	5	.23	C
3267.7	39234	5	7	1.2	C
3271.1	39404	7	9	1.1	C
3276.1	39613	9	11	1.1	C
3321.5	49211	9	7	.15	C
3517.3	37521	9	7	.14	D
3530.8	36955	5	3	.19	D
3545.2	37041	7	5	.18	D
3556.8	37205	9	7	.20	D
3589.8	36489	5	3	.37	D
3592.0	36673	7	5	.23	D
3715.5	39613	13	11	.16	C
3727.3	40430	9	9	.22	C
3732.8	39404	11	9	.16	C
3745.8	39234	9	7	.17	C
3750.9	40196	7	7	.20	C
3771.0	40002	5	5	.22	C
	V XX				
14.360	6964000	1	3	6.9 (+4)	C
160.0	625000	1	3	150.	C
	V XXI				
8.843	11308000	2	6*	6000.	C
8.882	11675000	4	6	6400.	C
9.111	11316000	2	4	8900.	C
9.175	11316000	4	6	1.04(+4)	C
9.352	10693000	2	6*	1.0 (+4)	C
9.633	10721000	2	4	1.63(+4)	C
	V XXI				
9.704	10722000	4	6	1.91(+4)	C
10.413	9603400	2	6*	2.0 (+4)	C
10.768	9627300	2	4	3.5 (+4)	B
10.853	9630600	4	6	4.2 (+4)	B
13.828	7231700	2	4	4.26(+4)	B
13.870	7209800	2	2	4.37(+4)	B
14.435	7268900	2	4	1.1 (+5)	B
14.578	7276300	4	6	1.3 (+5)	B
14.592	7268900	4	4	2.1 (+4)	C
27.95	10693000	2	6*	3000.	C
28.59	10722000	6	10*	6700.	C
40.20	9603400	2	6*	5800.	C
41.58	9629300	6	10*	1.4 (+4)	B
48.32	11673000	6	10*	1060.	C
58.39	11316000	6	10*	1660.	C
89.40	10722000	6	10*	2900.	C
240.0	416600	2	4	29.	B
293.7	340500	2	2	16.	B
	V XXII				
2.382	41986020	1	3	2.9 (+6)	B
	Xenon				
	Xe I				
1043.8	95801	1	3	.59	D
1047.1	95499	1	3	1.3	D
1050.1	95229	1	3	.085	D
1056.1	94686	1	3	2.45	C
1061.2	94229	1	3	.19	D
1068.2	93619	1	3	3.99	C
1085.4	92129	1	3	.410	C
1099.7	90933	1	3	.434	C
1110.7	90033	1	3	1.5	C
1129.3	88550	1	3	.044	C
1170.4	85441	1	3	1.6	C
1192.0	83890	1	3	6.2	C
1250.2	79987	1	3	.14	D
1295.6	77186	1	3	2.5	C
1469.6	68046	1	3	2.8	B
4501.0	89279	5	3	.0062	D
4524.7	89163	5	5	.0021	D
4624.3	88687	5	5	.0072	D
4671.2	88470	5	7	.010	D
4807.0	88843	3	1	.024	D
7119.6	92445	7	9	.066	D
7967.3	88745	1	3	.0030	D
8409.2	78957	5	3	.010	D
	Xe II				
4180.1	135708	4	4	2.2	D
4330.5	136598	6	8	1.4	D
4414.8	132208	6	6	1.0	D
4603.0	116783	4	4	.82	D
4844.3	113705	6	8	1.1	D
4876.5	130064	6	8	.63	D
5260.4	123255	2	4	.22	D
5262.0	131924	4	4	.85	D
5292.2	111959	6	6	.89	D
5372.4	113673	4	2	.71	D
5419.2	113512	4	6	.62	D
5439.0	121180	4	2	.74	D
5472.6	113705	8	8	.099	D
5531.1	113512	8	6	.088	D

TABLE 1b. Transition probabilities for selected atomic and ionic species—Continued

Wavelength (λ[Å])	Upper energy level (E_k[cm^{-1}])	Stat. weights g_i	Stat. weights g_k	Transition Probability (A[10^8 s^{-1}])	Unc.
	Xe II				
5719.6	113512	4	6	.061	D
5976.5	111792	4	4	.28	D
6036.2	111959	6	6	.075	D
6051.2	111959	8	6	.17	D
6097.6	111792	6	4	.26	D
6270.8	128867	4	6	.18	D
6277.5	111959	4	6	.036	D
6805.7	113512	8	6	.061	D
6990.9	113705	10	8	.27	D
	Ytterbium				
	Yb I				
2464.5	40564	1	3	.91	C
2672.0	37415	1	3	.118	C
3464.4	28857	1	3	.62	C
3988.0	25068	1	3	1.76	C
5556.5	17992	1	3	.0114	C
	Yb II				
3289.4	30392	2	4	1.8	C
3694.2	27062	2	2	1.4	C
	Zinc				
	Zn I				
748.29	133638	1	3	.060	C
765.60	130617	1	3	.076	C
792.05	126255	1	3	.057	C
793.85	125968	1	3	.18	C
809.92	123470	1	3	.26	C
1109.1	90158	1	3	.305	C
2138.6	46745	1	3	7.09	B
3075.9	32501	1	3	3.29(−4)	B
3282.3	62769	1	3	.90	B
3302.6	62772	3	5	1.2	B
3302.9	62769	3	3	.67	B
3345.0	62777	5	7	1.7	B
3345.6	62772	5	5	.40	B
3345.9	62769	5	3	.045	B
6362.3	62459	3	5	.474	C
11054.	55789	3	1	.243	C
	Zn II				
2025.5	49355	2	4	3.3	C
2064.2	96910	2	4	4.6	D
2099.9	96960	4	6	5.6	D
2102.2	96910	4	4	.93	D
4911.6	117264	4	6	1.6	D

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Wavelengths for about 47,000 spectral lines of atoms and atomic ions, as well as transition probabilities A for about 5000 lines, are tabulated. The data were selected in such a way as to include the prominent lines over a wide spectral region. Part I contains wavelengths of lines of neutral through quadruply ionized atoms in the range 40 to 40,000 Å. This information is presented in two different ways: 1) separate line lists grouped according to chemical element and further subdivided according to stage of ionization; and 2) a general table of wavelengths ordered numerically, with relative intensity, chemical element, and stage of ionization indicated for each line. Part II contains transition probability data for atoms in various stages of ionization, with emphasis on the neutral and singly ionized species. This table is arranged according to the chemical element and is further subdivided according to stage of ionization. Estimates of the accuracies of the A-values are provided. Wavelengths, energy levels, and statistical weights serve to identify the lines and to provide useful data for plasma spectroscopy applications.

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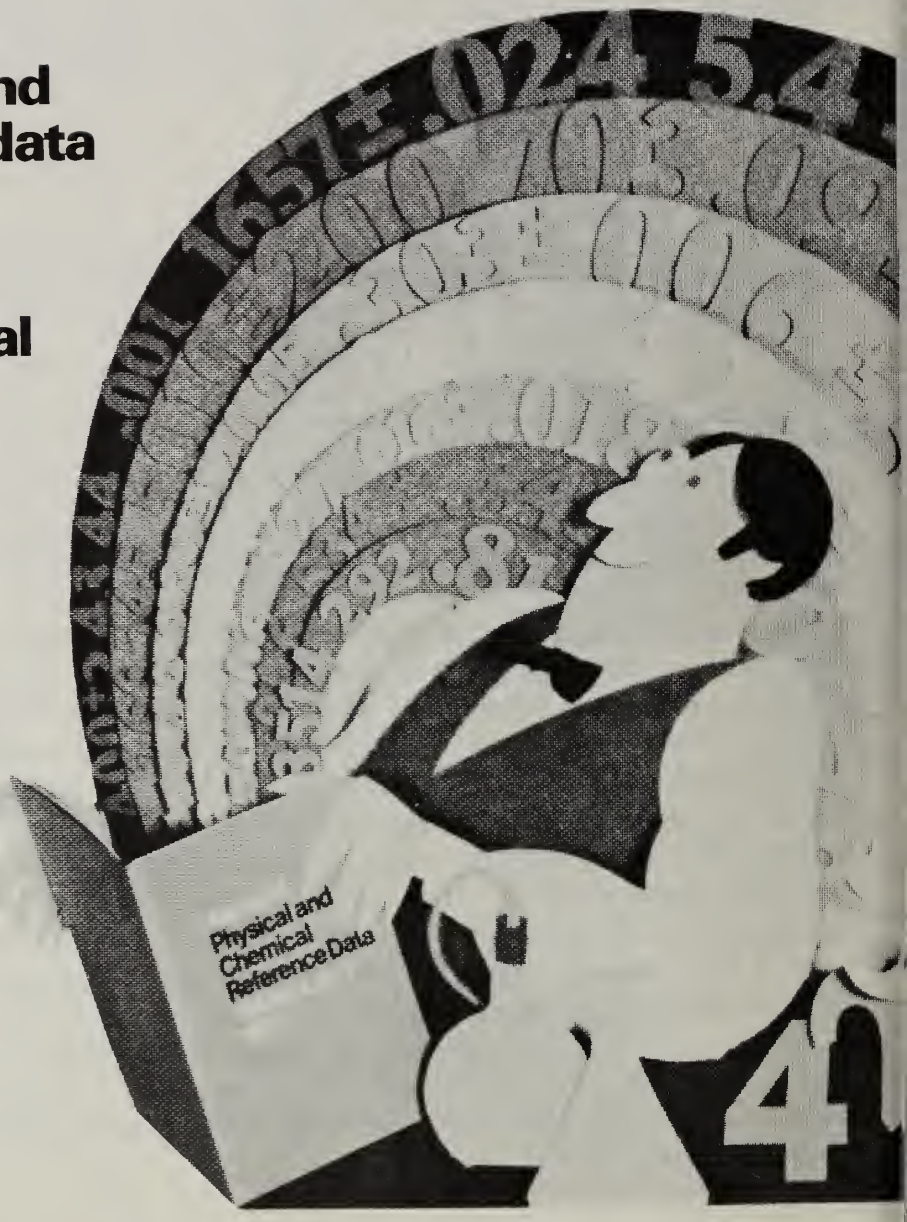

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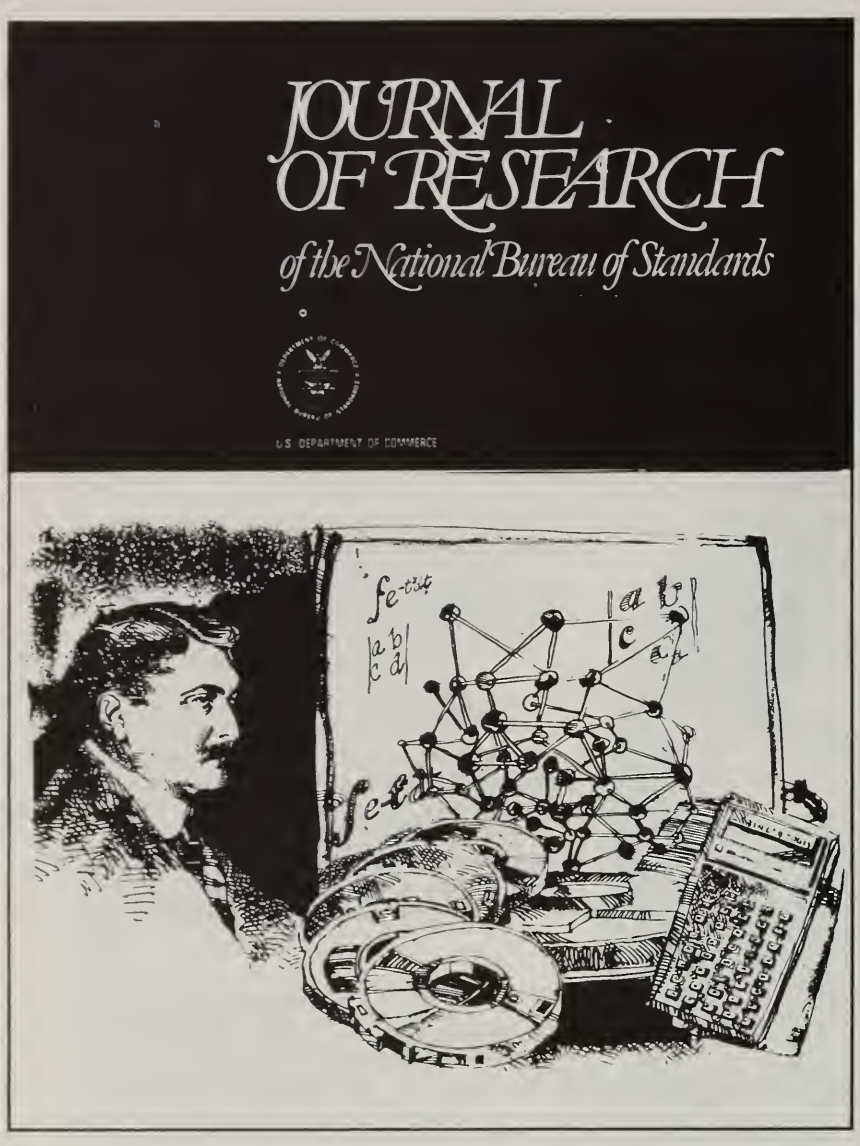

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